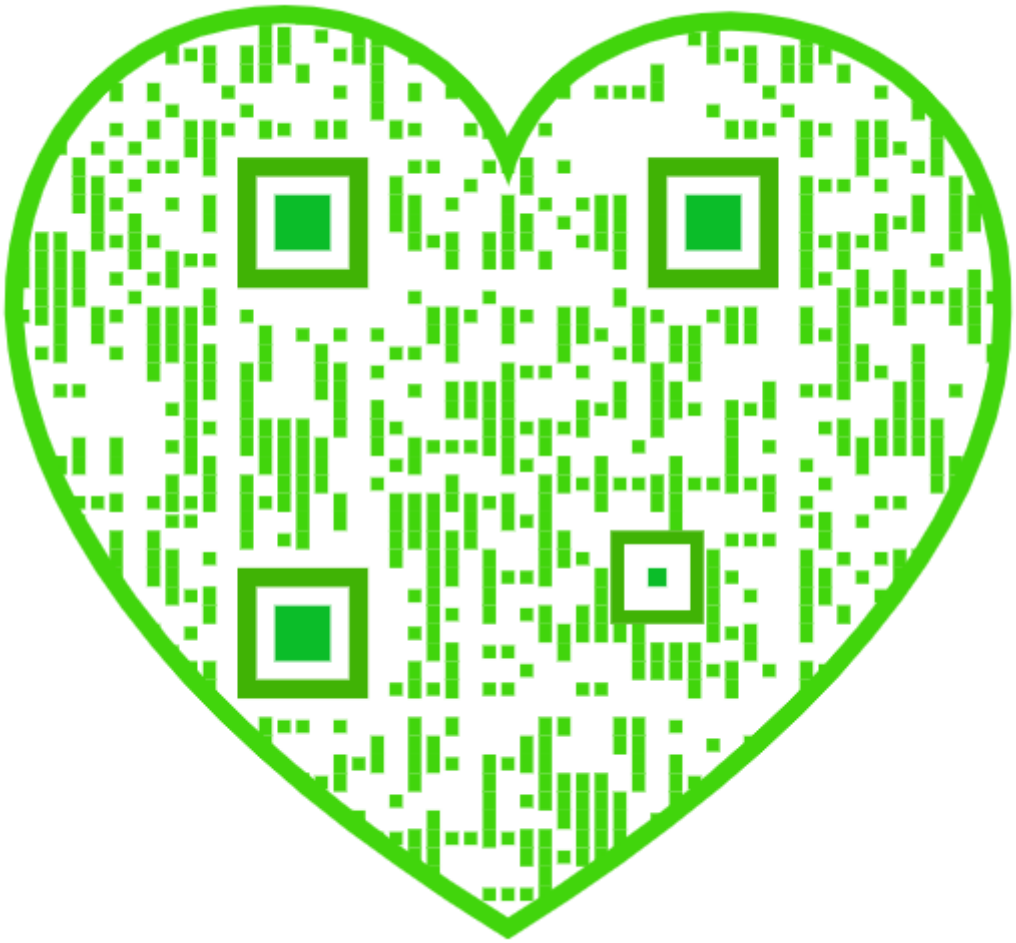

Lillian M. Hutting.
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MANUAL

OF

OBSTETRICS

BY

EDWARD P. DAVIS, A. M., M. D.

PROFESSOR OF OBSTETRICS IN THE JEFFERSON MEDICAL COLLEGE
PHILADELPHIA

WITH 171 ILLUSTRATIONS

PHILADELPHIA AND LONDON

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To the Students and Graduates
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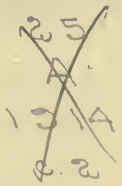

PREFACE

This book has been made to give a concise account of modern obstetrics. So rapid is the growth of modern knowledge that one who wishes to study the newest gains in obstetric science must consult the best journals throughout the world. It is the hope of the writer that this book may help the general practitioner and the medical student to study obstetric diagnosis from the clinical standpoint, and to learn how to make wise decisions in treatment.

Edward P. Davis.

Philadelphia, Pa.,
250 South Twenty-first Street
September, 1914

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MANUAL OF OBSTETRICS

DEFINITION

Obstetrics is the science of human reproduction. A similar study in warm-blooded animals other than human is embraced in veterinary medicine. The word "obstetrics" is supposed to convey the idea that the obstetrician or midwife aids the mother during parturition, performing a function which is confidential in the interests of both husband and wife.

Early obstetric science was the practice of midwives, and hence the name obstetrics does not occur during this period, but the treatment of human parturition was known as midwifery. When men began to study obstetric art and science, the modern science had its beginnings and persisted in a crude state until the discovery of asepsis and antisepsis, and the revolution in surgery which followed. This brought obstetrics into the domain of surgery as a science.

Modern obstetric science embraces the diagnosis of pregnancy in its various stages, a knowledge of the anatomy of the birth canal in the pregnant woman, the hygiene and pathology of the mother during pregnancy, and of the fetus as well. The mechanism, physiology and treatment of labor and its complications, form an important part of obstetric science.

The aseptic care of the mother during parturition and the repair of lacerations, introduces obstetric surgery. The performance of the operations necessary to save the lives of mother and child opens the way for obstetric surgery, and many of the injuries of the newborn require surgical attention. The complete restoration of the mother to health renders necessary the late performance of operations for the repair of injuries.

The most serious complications of pregnancy demand surgical attention, as in placenta prævia and accidental placental separation. In the important and complex condition known as the toxemia of pregnancy, a wide range of medical and surgical knowledge is essential to secure the best results.

Many unsolved problems of great importance remain in obstetric science. The causes of eclampsia are yet unknown, and there is still question concerning the best means of preventing this serious accident. Conditions which sometimes destroy the fetus are not completely understood, and much is still to be learned in the saving of infant life.

Modern obstetric science embraces a considerable field of anatomy, physiology, pathology and surgery. The responsibility of the obstetrician is great, as two lives are in his care. To-day, advances in obstetric surgery have been made, with greatly reduced mortality and morbidity, which enable the obstetrician to deal with serious problems satisfactorily.

PART I

ANATOMY AND PHYSIOLOGY

CHAPTER I

THE ANATOMY OF THE NORMAL BONY PELVIS

The bony pelvis, as a whole, is situated at the termination of the spinal column and affords articulation for the lower extremities. It is a bony basin or girdle, composed of individual parts bound together by ligaments. In previous

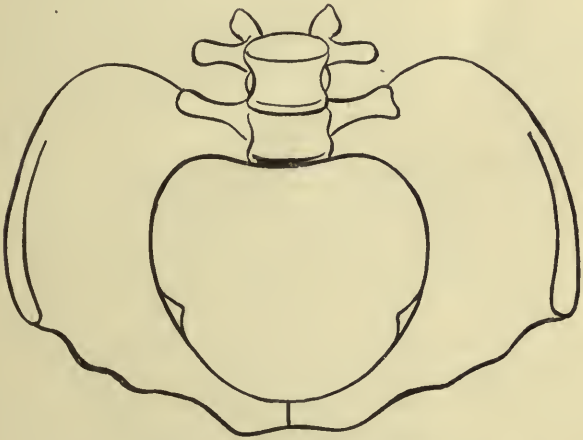

Fig. 1.—Normal female pelvis.

stages of evolution, when the human being assumed the upright posture less constantly than now, an important function of the pelvis was to contain the organs of generation and to shelter the growing embryo until the increasing size of the

womb encroached upon the abdominal cavity. As human beings stand habitually upright the pelvis has given greater support to the head and trunk. Its individual bones are the sacrum, the two innominate bones, each composed of the ilium, the ischium, and the pubes, and in addition the termination of the spinal column in the coccyx.

The Sacrum.—This bone is composed of vertebræ joined together, the bone being concave, projecting backward, its upper portion marking the projection known as the promontory of the sacrum. As the bone is broader along the anterior surface than on the posterior surface, with the individual in the upright position, it would fall downward and forward were it not bound firmly to the two innominate bones by the sacro-iliac ligaments. The sacrum is the most important bone in the pelvis, as it is the most fixed point in the pelvis upon which the two lateral halves rotate during parturition in young persons. Its promontory lessens the space at the entrance to the pelvis from above, and makes what is called the superior or upper strait of the pelvis. The posterior surface of the sacrum contains the termination of the spinal canal and the end of the spinal cord. The sacrum is not only the largest, but the heaviest and strongest bone in the pelvis.

The Ilia.—The ilia are the upper portions of the innominate bones and are peculiar for a projecting wing which forms the iliac fossa on each side and constitutes the greater portion of the upper pelvis, or what is sometimes called the false pelvis. The crests of the ilia are broad and rough, giving origin and insertion to the abdominal muscles, while in the iliac fossæ lie the ilio-psoas muscles which extend along the pregnant pelvis on each side. On the anterior surface of each ilium at the anterior extremity of its crest is a bony landmark, the anterior superior spine of the ilium, which can be detected in all individuals, and is a bony landmark on measuring the pelvis. At the posterior extremity of the iliac crests are the posterior superior spines, also landmarks for measurement. The ilia terminate at their junction with the sacrum in an irregularly roughened joint surface containing a synovial membrane, these surfaces being firmly bound together by strong bands of ligament on the posterior surface,

known as the sacro-iliac ligaments. The contour of the ilia varies somewhat in different races, and is an essential characteristic in the normal pelvis. At the lower external portion of the ilia are the acetabular cavities which receive the heads of the femora. The inner portion of the ilium terminates in a distinct curved surface, known as the pelvic brim or linea terminalis. This curve is continued along the pubes to the anterior portion of the pelvis at the pubic joint.

The Ischia.—Beneath the acetabular cavity is a strong, irregularly circular bone with a foramen, the lower extremity being slightly curved, broad, and a bony landmark called the tuberosity of the ischia, upon which rest the greater part of the weight of the body in the sitting posture. The foramina serve to permit the passage of vessels and nerves from the interior of the pelvis to the lower extremities. On the internal surface of each ischium is a projecting ridge directed upward and inward, which can be felt by vaginal examination, and which is called the spine of the ischium. Like the promontory of the sacrum, it encroaches somewhat upon the space at the lower part of the pelvic cavity.

The Pubes.—The upper rim of the anterior pelvis is composed of the two pubic bones. Their upper branches are known as rami of the pubes, terminating at the centre in a projection which can usually be felt through the external skin by making pressure over the pubic joint. The two pubic bones terminate in the symphysis pubis, composed of cartilage, the bones being firmly fastened by two strong bands of ligament above and below. Like the sacro-iliac joints, the pubis is an articulation, and during pregnancy the two pubic bones move upon each other through the elasticity of the joint.

The Coccyx.—While the sacrum is thick, comparatively heavy, and contains four foramina for the exit of nerves, the coccyx is composed of four vertebræ, diminishing in size, and contains no openings. It is the vestige of the tail and was more highly developed in a previous state of evolution. It is joined to the sacrum by ligamentous fibres with a joint which permits it to move upon the sacrum.

The Upper or False Pelvis.—By the upper or false pelvis is meant the expanded wings of the ilia which lie above the

true pelvic brim. The abdominal and back muscles are attached to the upper pelvis and the expanded termination of the abdominal cavity is formed, in which are contained the intestines in the non-pregnant patient, and upon which during pregnancy often rests the enlarged uterus. It has no function in labor and is rarely of importance in obstetric study, except for the fact that the ilia present bony landmarks for measurement and the important sacro-iliac joints.

The True or Lower Pelvis.—As the fetus must pass through this cavity, it is of great importance to the obstetrician. In the centre posteriorly is the sacrum with its projecting promontory and its backward curve beneath the promontory. From the sacro-iliac joints to the pubis on each side runs the linea terminalis, or iliac line or pelvic brim. In the normal pelvis this is essentially a regular curve, terminating anteriorly in the pubic joint. It is obvious that at the pelvic brim the promontory of the sacrum encroaches upon its space, and that at each side of the promontory there is a curved space which can accommodate a globular body of considerable size. The significance of this will become apparent in studying the mechanism of labor.

The Pelvic Cavity.—Beneath the brim of the pelvis is the space known as the pelvic cavity, whose posterior wall is formed by the sacrum and coccyx; the lateral walls by the ilia, ischia, pubes, the greater portion of the lateral walls of the pelvic cavity being made by ligamentous fascia and muscular tissue. Through the pelvic cavity runs, upon the left side, the rectum, which encroaches upon its space. It is through this cavity that the fetus must pass in parturition. The pelvic cavity terminates at the strong muscular and ligamentous diaphragm, called the pelvic floor. It is important to remember the irregular contour of the pelvic cavity, and the fact that it is of sufficient size in the normal woman to permit the passage of the fetus during labor.

The Pelvic Outlet.—In the unimpregnated patient the pelvic outlet practically does not exist. The pelvic diaphragm or floor is pierced by the urethra, the vagina and the anus, but these apertures are normally closed by sphincter muscles. The vagina is so situated that it is upon the anterior portion of the pelvic outlet, and hence to emerge

through this orifice the fetus must pass toward the front of the mother's body, or from behind forward. The bony landmarks of the pelvic outlet are the tuberosities of the ischia, which give an idea of the space between the ischia. The depth of the pelvic outlet is inferred by obtaining the distance from the lower border of the pubes to the end of the coccyx.

The Lateral Walls of the Pelvis.—The inner surface of the ilia and ischia can be palpated by vaginal examination. These constitute an inclined plane, so directed that a globular body pressed against these surfaces might turn downward and forward. Our recent knowledge, however, leads us to believe that these surfaces are of little importance and that the turning of the child in birth is produced by other causes.

The Pelvic Planes and Axis.—Obviously the pelvis may be minutely studied by passing an infinite number of planes through its cavity. For practical purposes such study is too minute to be useful. The function of such planes is to enable us to ascertain the axis of the pelvis, an imaginary line at right angles to each of these planes thus constituting a curve. By such study of the dried pelvis, and by practical observation, we find that the axis of the pelvis is a line directed into the brim downward and backward, until it strikes the anterior surface of the sacrum near the coccyx. As the posterior wall of the pelvis is strong and unyielding, to emerge from the pelvis a moving body must turn in the direction of the least resistance, which would be upward and forward beneath the pubic joint.

The Diameters of the Pelvis.—The diameters of the pelvis are obtained by measuring between the various bony landmarks, and such diameters are external and internal.

The internal diameters of the pelvic brim are as follows: The antero-posterior diameter, from the middle of the promontory of the sacrum behind to the middle of the posterior surface of the pubic joint in front, measures 11 cms. or 4⅓ inches. This is also termed the true conjugate, and is an important measurement in estimating the pelvic size.

The transverse internal diameter of the pelvic brim is a line drawn transversely between the two iliac bones at their junction with the ischia and in the linea terminalis. In the

dried pelvis this is the largest diameter of the brim, measuring 13.5 cm., or 5 plus inches.

The oblique diameters extend from the sacro-iliac joints behind to the middle of the pubic arch in front, and are named respectively from the sacro-iliac joints, right and left. They measure in the dried pelvis 12.75 cm., or $4\frac{3}{4}$ inches.

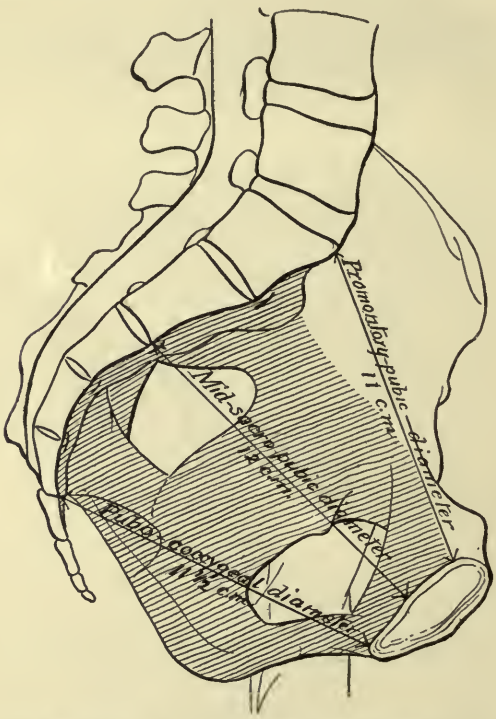

Fig. 2.—The diameters of the pelvic excavation (Farabeuf and Varnier)

One can readily see that in the dried pelvis at the brim the measurement of width is greatest, while the distance from before backward is least.

While mathematically an infinite number of diameters may be devised for the study of the pelvic cavity, such is impracticable, and an average diameter is usually considered.

Such would be from 12 to 13 cm., or 4½ to 5 inches. The practical importance of this measurement lies in the fact that it is sufficiently large to permit the head of a normal fetus completely flexed or extended, to rotate within the pelvic cavity.

The outlet of the pelvis, or inferior strait, measures from side to side between the tuberosities of the ischium, 11 cm., or 4⅓ inches; from the pubes to the coccyx, the average measurement is 9.5 cm., or 3¾ inches, which is increased during birth by the backward movement of the coccyx on the sacrum to 5 inches.

The External Diameters of the Pelvic Brim.—It is practically impossible to measure the pelvic brim accurately in the living patient, and we have recourse to bony landmarks, which by external measurement give us a fairly accurate idea of the pelvic size.

We measure the width of the pelvic brim by taking the distance between the anterior superior spines of the ischia—26 cm., or 10 inches. Another measure of width is obtained by measuring between the outermost points of the iliac crests—28½ cm., or 11 inches; and a further measure of width is afforded by the distance between the trochanters of the femora—32½ cm., or 13 plus inches.

To obtain the diagonal measurements externally of the pelvic brim, we measure between the posterior superior spine of the ilium on one side to the anterior superior spine of the ilium on the opposite side—a distance of 22 to 23 cm., or 8 plus inches. Of this, the right measurement is often slightly larger than the left.

To obtain the antero-posterior diameter of the pelvis externally, we measure from beneath the last lumbar vertebra to the middle of the external surface of the pubic joint—20½ cm., or 8 inches. Through measurements of large numbers of sacra, we know that the average thickness of the sacrum and pubis is 3½ inches, and subtracting this, we obtain 4½ inches for the true conjugate or internal antero-posterior diameter.

When we attempt to measure the internal antero-posterior diameter by vaginal examination, we can sometimes touch the promontory of the sacrum with the tip of the longest

finger, and noting where the hand inserted bears against the lower edge of the pubic joint, we obtain the measurement from the promontory of the sacrum to the lower edge of the pubis. This, however, is not what is desired, for we cannot measure with the hand between the upper edges of the pubis posteriorly and internally, and the promontory of the sacrum. We must deduct from this the height of the pubis. The measurement just described is, on the average, 13½ cm., and the average height of the pubis may be taken as 2 cm.; and deducting 2 from 13½ gives us 11½ for the interior antero-posterior diameter, or true conjugate, or 4¼ to 4½ inches.

A further external measurement useful for comparison is the pelvic circumference obtained by passing a tape-line around the pelvis just beneath its crest, and meeting at the pubic joint. This in normal subjects varies from 85 to 90 cm.

Pelvic Inclination.—It is obvious that the pelvis is not perpendicular, but that the sacrum is inclined forward and the coccyx backward. This tipping or inclination of the pelvis is of practical importance in directing downward the child in its passage through. It varies greatly with the posture of the patient and with various conditions, and it is not of great practical importance.

The Pelvic Joints.—We must again draw attention to the sacro-iliac and pubic joints. They are of great importance, for during labor they perform the true function of a joint in permitting motion of the two elements which make the joint. While the fetus accommodates itself to the pelvis during parturition, the pelvis also accommodates itself to the fetus, and this is possible because the pelvic joints are true joints, permitting motion. In normal cases the pelvic joints are unusually mobile during pregnancy, but regain their slight mobility only when the mother recovers from labor. In cases of complicated birth or disease of the pelvic joints they may become ankylosed or may remain unusually mobile, both conditions affecting seriously the health of the mother.

The Difference Between the Male and the Female Pelvis.—Early in the intrauterine life, with the determination of

sex, the fetus develops the essential characteristics of its pelvis. The male pelvis has heavier bones than the female, its walls are longer, it is narrower, the surfaces for muscular attachment are larger and rougher, and the pubis is narrow instead of flaring widely outward. Thus, the outlet of the male pelvis is much smaller than that of the female.

The Child's Pelvis.—While the sex of the child may early be developed, the pelvis has characteristic shape. The bones contain more cartilage than those of the adult; the spine has little curve; the pelvic brim is higher; and the projection of the promontory of the sacrum much less. The child's pelvis has far less space, relatively speaking, so that the bladder which is often in the pelvis of the adult, is an abdominal organ in the young child.

The Forces Developing the Pelvis.—As the pelvis is composed of elastic living tissue, it grows with the rest of the body. Two forces are of great importance in its development: One is the weight of the head and trunk pressing downward upon the promontory of the sacrum. This force would separate the sacrum from the ilia were it not for the sacro-iliac ligaments. The force from above downward is resisted by the strength of the curved lateral walls of the pelvis acting in principle like the mechanical arch.

Opposing these forces from above downward, and exerted at an obtuse angle to its direction, is the force transmitted through the lower extremities and through the necks of the femora. To resist this the lateral halves of the pelvis assume their curved shape as the child grows sufficiently old to walk and to take exercise. The shape of the pelvis then is largely determined by these two forces, and in cases where the child does not walk, but is able to sit, the pressure from above downward causes the promontory to project unduly, while the lack of lateral force results in failure in the development of the two pelvic halves.

The pelvis also has motion upon the sacrum at the sacro-iliac joints, and the two halves of the pelvis are bound together by the pubic and sacro-iliac ligaments as the two piers of a cantilever bridge are fastened. The two halves of the pelvis rotate asunder, and if the two piers of the bridge be severed by cutting the pubic ligaments the two halves move

upward and outward, because the opposite ends are heavily weighted.

Accident, lack of proper food and disease, interfere with the normal development of the pelvis, producing deformity. The shape of the pelvis varies in different races, in accordance with the contour of other parts of the skeleton. The pelvis varies considerably in size in different individuals, without deformity.

A knowledge of the form, size and functions of the pelvis is of paramount importance in obstetric study.

CHAPTER II

THE ANATOMY OF THE ABNORMAL BONY PELVIS

The Infantile Pelvis.—This pelvis, from causes usually unknown, does not assume the characteristic female type, but remains small and ill-developed. It is symmetrical, resembling essentially the male pelvis. Its diminutive size and male type make the diagnosis of infantile pelvis. Obviously it would create a barrier to labor should impregnation

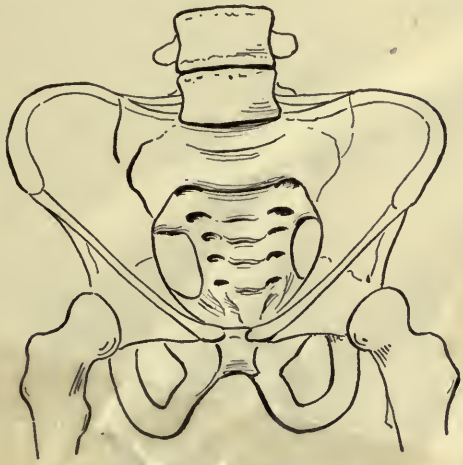

Fig. 3.—Infantile pelvis.

occur in such an individual, unless the child were correspondingly small and imperfect.

The Generally Contracted or Justo-Minor Pelvis.—This pelvis has the essential shape of the female type, but is below the average in diameter. It is not deformed, and is usually seen in tall, unusually slender, and ill-developed women.

Such a person has hips so narrow that the size of the pelvis can be inferred by observing the breadth of the hips. Other

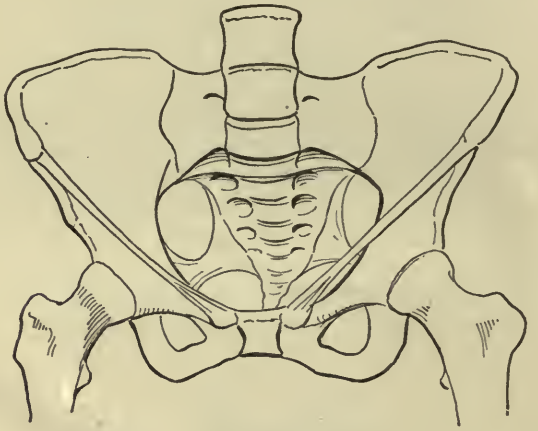

Fig. 4.—Justo-minor pelvis.

portions of the skeleton are correspondingly narrow, as the thorax, the neck, and often the face. Here again this pelvis

Fig. 5.—Flat rhachitic pelvis.

may occasion serious difficulty in labor, unless the child be correspondingly small and ill-developed.

The Symmetrically Large or Justo-Major Pelvis.—The opposite of the preceding, this pelvis has the characteristic female type and is larger than the average in all diameters. It is symmetrical and is usually found in short, broad-shouldered women with wide hips. It is often accompanied by very strong muscles and vigorous general health. Such women frequently give birth to large and well developed children without abnormal mechanism in labor. Should, however, the child be smaller in proportion than the pelvis, abnormal presentation or position may result.

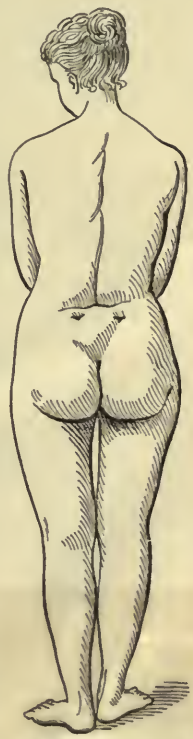

Fig. 6.—Woman with flat pelvis (after Stratz).

The Simple, Flat Pelvis.—In this pelvis, through some fault of development, the promontory of the sacrum projects further forward than normal, thus lessening the internal antero-posterior diameter of the pelvis. It is often difficult to accurately recognize the cause of flattened pelvis, but in some cases the child has been ill-nourished and has been urged to stand and to walk too early. This pelvis is deformed only in the antero-posterior diameter, and thus may readily escape detection unless the pelvis is measured.

Flat Rhachitic Pelvis.—This pelvis is not only small in all diameters, but flattened as well. It is found in persons ill-developed and where, in addition, there has been some circumstance or condition which led to the downward and forward pressure upon the promontory of the sacrum.

Imperfect Development in Various Portions of the Pelvis.—Sometimes one portion of the pelvis only is ill-developed, the remainder being normal. Such abnormality is most frequently seen in the sacrum. When one wing is deficient, the pelvis is styled *Naegele;* when both are imperfect, the *Robert.*

The Rhachitic Pelvis.—Rhachitis is very commonly observed among negroes, less frequently among the whites. If present in any considerable degree it alters the size and shape of the pelvis.

Rhachitis is essentially an overgrowth of ill-developed bone, at first unduly soft and yielding, which results in deformity of the pelvis through pressure, and then hardening into unusually thick bone, causing deformity and lessened space through abnormal thickness. The most important feature of the rhachitic pelvis is the loss of contour at the

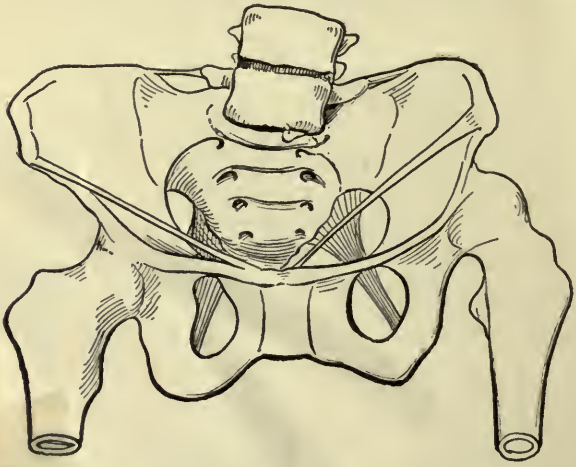

Fig. 7.—Irregularly deformed rhachitic pelvis with scoliosis.

brim. This may be recognized by taking the external measurements of the pelvis, when it will be found that the distance between the spines of the ilia is equal to or greater than the distance between the outermost points of the crests. At the pelvic brim the pelvis may or may not be flattened. The pelvic brim is rarely symmetrical, but is often deformed by the oblique projection of the promontory and sacrum. Other portions of the pelvis may be deformed, thus altering considerably the shape of the pelvic cavity. The degree of contraction varies from slight contraction to such which makes it impossible for the pelvic organs to enter

the pelvis, and which renders the birth of the fetus at any stage of fetal existence impossible. Together with pelvic deformity, the patient shows the general signs of rhachitis.

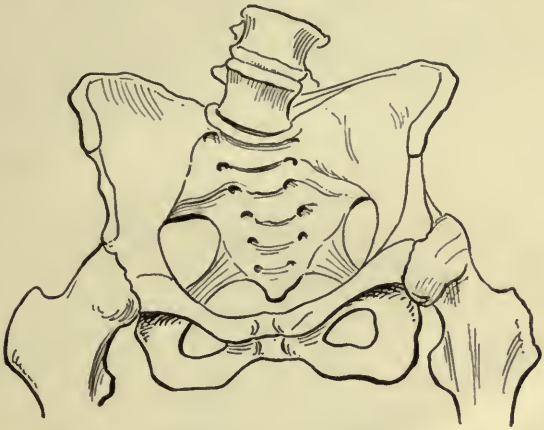

Fig. 8.—Obliquely contracted deformed pelvis.

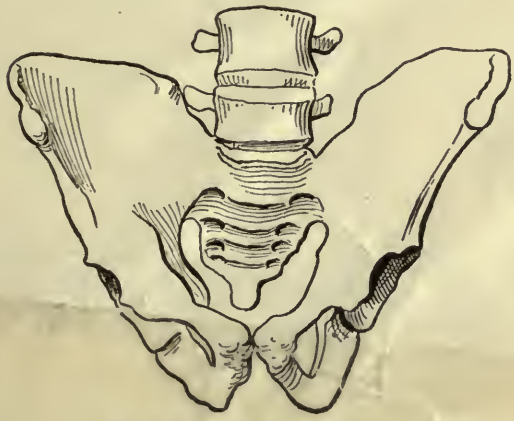

Fig. 9.—Funnel-shaped pelvis.

The cranium is unusually broad, the forehead projecting, and the cranial bones unusually thick and hard. The sternum may be deformed and the patient may be pigeon-breasted.

The articulations of the ribs with the sternum are enlarged and can plainly be felt. The epiphyses of the long bones are enlarged, the lower extremities bent and the patient's general appearance is that of disease and abnormality in the skeleton. Often the vertebræ at the brim of the pelvis are altered, the promontory of the sacrum may be double, or the sacrum greatly thickened and projecting. Contraction in various degrees may accompany rhachitis throughout the pelvis, so that no typical shape can be given for the rhachitic pelvis; but each case must be studied upon its individual condition. The tendency of the rhachitic pelvis, if the

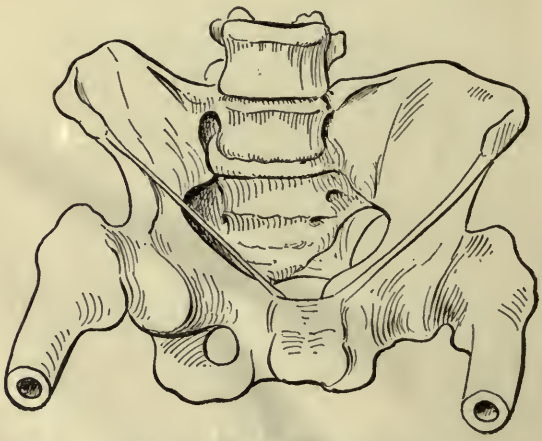

Fig. 10.—Osteomalacic pelvis.

patient lives through childhood to adult life, is to become heavier and firmer than normal. The pelvic joints are often less mobile than in the average patient, and the pelvic bones harder than usually found.

The Osteomalacia Pelvis.—This disease is a process of softening affecting the pelvis, vertebræ and ribs. The bones become soft, lighter in weight, and readily bent. The condition is seen in adults and is attended with pain throughout the bones, somewhat resembling rheumatic pain. As the softening increases the patient is unable to stand or sit and is finally confined to her bed. That the disease is connected

in some way with the presence and activity of the ovaries is indicated by the fact that the removal of the ovaries often stops the progress of the disease.

The deformity produced by osteomalacia has no regular type. The two halves of the pelvis bend inward toward the center; the promontory of the sacrum projects downward, and usually to one side. While the condition is comparatively rare in this country the diagnosis is not difficult, from the marked deformity and clinical history.

Fig. 11.—Woman with kyphotic pelvis.

Spinal Deformity Affecting the Pelvis.—The projection forward or backward of the vertebræ at the pelvic brim may complicate labor and deform the patient. To sustain the weight of the body the projection backward of the vertebræ in one portion of the spinal column is compensated by a projection forward in another portion of the spine; so in the hunchback the kyphosis or backward projection of the lumbar, and possibly upper sacral vertebræ, is balanced by the projection forward in the dorsal region, which is known as lordosis. While such abnormality in the spinal column may not actually deform the pelvis, it alters the shape and capacity of the abdomen and chest and brings the uterus into abnormal relation with the pelvis at birth. It may accompany bony deformity; so a lateral curvature of the spine, scoliosis, may interfere with normal parturition, because the uterus is not brought naturally in relation with the axis of the bony pelvis.

The spinal column may also be deformed in its junction with the sacrum. The last lumbar vertebræ may be partially dislocated and rotated upon the sacrum. Conditions known as spondylolisthesis and spondylizema are illustrations of such deformity.

The Effect of Lameness or Injury Upon the Pelvis.—As the pelvis develops in response to the stimulus of exercise, so in a growing girl who has disease preventing exercise, the pelvis may become deformed. In a case observed by the writer, a young woman, when thirteen years of age had tubercular disease of the right knee-joint. For this she was kept in bed for the greater part of a year. She improved somewhat and upon motion became worse, was again in bed, and finally had resection of the joint. The right lower extremity was practically paralyzed for several years. As a result of this the

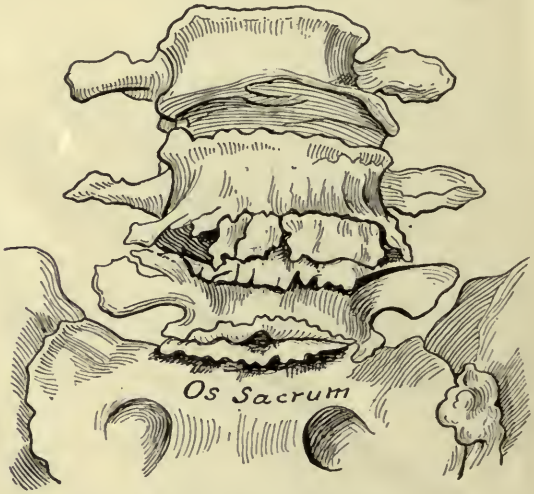

Fig. 12.—Spondylolisthesis.

right oblique diameter of the pelvis was permanently shortened, and when she became an adult, and pregnancy and labor occurred, difficulty resulted.

One may readily see how paralysis of the lower extremities would result in considerable diminution in the size of the pelvis.

The pelvis may be deformed by direct mechanical violence; thus, a young girl fell from a tree, striking upon her hip, breaking the neck of the femur, and driving it through

the acetabular cavity. The callus which formed and the impacted fracture persisted, and when grown and in the pregnant condition vaginal examination showed that side of the pelvis much deformed and much smaller than the other.

Pelvic Abnormality Caused By Disease.—The pelvic bones may become necrotic, the pelvic joints tubercular, and the shape and size of the pelvis altered in consequence. The growth of tumors springing from the periosteum or bony tissue, as osteo-sarcoma or enchondroma, may greatly lessen the capacity of the pelvis.

Pelvic Deformity From Dislocation.—As a result of disease, or failure of development, the mobile parts of the pelvis may become permanently displaced and deformity result. When by accident or injury the coccyx has been broken, or the sacro-coccygeal joint partially torn asunder, bony union may occur at a considerable angle, and the coccyx lose its normal motility.

In a patient seen by the writer, the coccyx had been injured while riding, and some years later when labor occurred it was immobile and offered a considerable obstruction to the birth of the child.

Congenital dislocation of one or both femora may interfere with the development and the normal size of the pelvis.

The Frequency of Abnormal Pelves.—In 1224 patients examined by the writer, by external and internal measurement, 25 per cent. had pelves smaller than the average. These patients included all races in this country, except Chinese and Indians. Various observers differ in the statement as to which is the most common variety of abnormal pelvis. Among whites, the justo-minor or generally contracted pelvis is not uncommon in those who have been badly nourished children, from luxury, or from want. Among negroes, the rhachitic pelvis is common. It may be said that among white persons the most usual deformities of the pelvis are those resulting from lack of development in native Americans. In Europeans coming from the peasantry, where hygienic conditions are bad, and want prevails, rhachitis and osteomalacia are observed. Certainly one-third of the pelves coming under observation among obstetricians

differ somewhat from the average in size or contour. This fact should emphasize the necessity for measuring the pelvis and for studying the comparative size of the fetus in all primiparous patients.

The diagnosis of pelvic deformity will be considered under the complete examination of the pregnant woman.

CHAPTER III

PHYSIOLOGY OF IMPREGNATION

The Physiology of Normal Impregnation.—Impregnation occurs, as physiology teaches us, by the union of the ovum and spermatozoa. In normal pregnancy the impregnated ovum passing from the Graafian follicle in the ovary, enters the Fallopian tube through its fimbriated extremity and passes along the tube to the interior of the uterus. This motion is effected largely by the ciliated epithelia lining the Fallopian tube. The passage of the ovum from the ovary to the interior of the uterus occupies a varying period whose exact duration is unknown, but which is frequently several days in duration. As soon as impregnation occurs a change develops in the lining membrane of the uterus. This becomes sensitized to the ovum, its circulation of blood increases, and it is in a condition favorable for the lodgment and attachment of the ovum. Entering the uterus through the Fallopian tube the ovum normally lodges and attaches itself on the uterine surface at about the middle of the upper expulsive segment of the uterus. The exact point of its attachment is determined by the normal development of the uterus and by the healthy condition of its lining membrane. The successful development of the ovum depends upon its normal attachment, for if it fails to enter the uterine cavity it cannot develop, and if it becomes attached to the dilatable portion of the uterus it cannot go to full term without danger to the mother and fetus through hemorrhage. As the uterus is originally developed in two halves, joined in the centre, the ovum may normally develop almost entirely upon one side of the uterus, thus producing, as pregnancy advances, an abnormal projection of this portion of the uterus, which may be mistaken for an abnormality in the womb, and occasionally for a fibroid tumor. In such cases when labor is over the uterus resumes its normal contour.

THE PHYSIOLOGY OF ABNORMAL IMPREGNATION

Instead of proceeding into the uterine cavity for its final lodgment the impregnated ovum may remain in the Graafian follicle and the ovary, in the Fallopian tube, in the wall of the uterus, or attach itself to the distensile portion of the womb in the lower uterine segment, as low as the internal os. This is called ectopic pregnancy. When the impregnated ovum lodges in the Graafian follicle or adheres to any portion of the ovary, it is called ovarian pregnancy. Obviously the ovum cannot grow large in this position and must attach itself partly to surrounding tissue, peritoneum, intestine, omentum or mesentery, if its life is to continue. So an ovarian pregnancy is recognized microscopically by finding in some portion of the sac of the embryo or fetus ovarian tissue, showing that the embryo originally was attached to the ovary.

If the impregnated ovum lodges in the Fallopian tube it may there develop until it has grown so large that the tube can no longer contain it. Its presence may excite the contraction of the elastic and unstriped muscle tissue of the tube, and the ovum may be forced out through the fimbriated extremity in tubal abortion. It may still live by attaching itself to omentum, mesentery, or intestine, when it becomes an abdominal pregnancy.

If it does not escape through the fimbriated extremity of the tube, it may burst the Fallopian tube, and if considerable hemorrhage occurs the ovum will die, and sometimes the mother also. Should this not occur, the ovum may lodge between the layers of the broad ligament and develop to a considerable extent in that position and escape into the abdominal cavity to nearly full term among the intestines. It then becomes an abdominal pregnancy.

If the impregnated ovum lodges in the Fallopian tube as it passes through the wall of the uterus at the uterine cornu, it may develop for some weeks as an interstitial pregnancy. It will finally escape into the cavity of the uterus, or rupture the uterine wall and be expelled into the pelvic or abdominal cavity. It will then cause hemorrhage and symptoms like those of ruptured tubal gestation.

If the impregnated ovum lodges below its normal point of attachment it will adhere to the lower uterine segment. This must dilate while labor occurs and becomes gradually stretched as the fetus grows. The placenta by which the fetus is attached to the womb will then become partially or wholly separated, and in many cases the death of the mother and child results from hemorrhage. The ovum may attach itself so low upon the lower segment of the womb as to extend across, completely covering the internal os. The low attachment of the impregnated ovum is a form of ectopic gestation, commonly known as placenta prævia.

CHAPTER IV

THE ANATOMY OF THE BIRTH CANAL IN PREGNANCY

As a result of pregnancy, the generative organs and pelvis undergo changes adopted for the growth of the ovum and the final expulsion of the fetus.

The Ovary in Pregnancy.—There is no conclusive evidence that the ovary as a gland is greatly altered during pregnancy. The Graafian follicle, whence comes the impregnated ovum, undergoes the usual process of contraction, with the formation of corpus luteum. This is colored differently and more brilliantly in pregnancy than in the non-pregnant, the color varying in different warm-blooded animals. In the human species the color is dark yellow or orange, and pregnancy may be recognized by the characteristic appearance of the corpus luteum. The position of the ovary varies from the normal during pregnancy, as the ovaries and tubes are drawn upward by the growing uterus through stretching of the broad ligaments until they are frequently found at full term considerably above the pelvic brim. As the uterus is usually rotated from left to right as pregnancy advances, the right tube and ovary will be further posteriorly at the pelvic brim than normal, and the left tube and ovary further anteriorly.

The Fallopian Tubes.—The Fallopian tubes share in the changes which occur in the pregnant uterus. They become more vascular, the lining membrane forming a secretion which is supposed to nourish the impregnated ovum while it remains in the tube. The position of the tubes, as has been stated, varies somewhat with the period of pregnancy and the growth of the womb.

The Uterus.—So soon as pregnancy occurs the lining membrane of the womb or endometrium undergoes new and remarkable cell activity. Large oyster-shape cells form upon the surface of the endometrium, which can be recognized

upon microscopic examination, and which constitute the decidual cells. The glands in the endometrium, called utricular, increase in size and form albuminoid secretion, furnishing nourishment to the embryo until the placenta forms. The decidual cells gradually form a membrane, known as the deciduous membrane, which lines the uterus and is reflected upon the ovum, completely enclosing it.

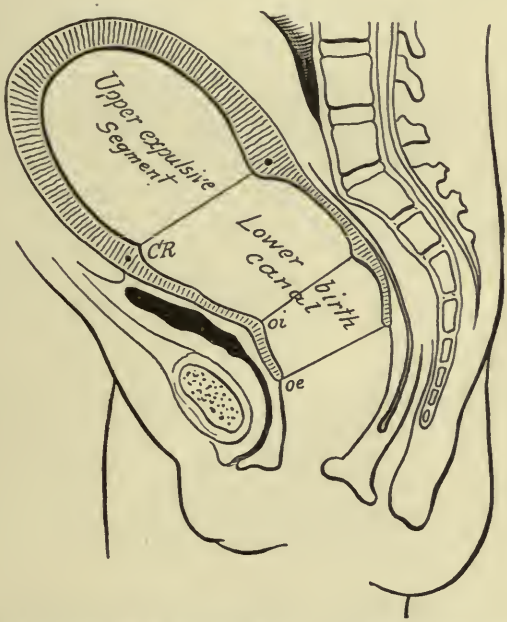

Fig. 13.—The birth-canal during labor; *CR* to *oi*, lower uterine segment; *oi* to *oe*, cervix.

The blood vessels of the uterus increase in capillary formation, and as pregnancy proceeds the circulation of the uterus becomes very free and greatly enlarged. The muscular tissue of the uterus develops in longitudinal, circular and oblique fibres by the multiplication of muscle nuclei. With this there is accompanying growth of connective and elastic tissue, and the sinuses or blood vessels of the uterus develop until at term they are large enough to admit an ordi-

nary lead pencil. With the growth of the uterine muscle is the development, from its ganglia, of the nerves which supply this muscle. The entire growth of the uterus as a hollow muscular organ is from 10 to 12 times its original size, the thickness of the uterine muscle depending upon the vigor and general muscular development of the mother and her primiparity or multiparity. The muscular tissue of the uterus comprises seven-eighths of its entire length. The remaining one-eighth is the elastic portion, just above the cervix, known as the lower uterine segment, the upper being called the expulsive upper segment. The lower segment contains little muscular tissue and is composed of elastic and dilatable tissue comparatively thin. This lower segment may be recognized early in pregnancy by its thinness and elasticity, and the lower edge of the upper expulsive segment projecting above it, upon pressure. As pregnancy advances the lower segment becomes gradually distended by the presenting part of the fetus and has an influence in determining and maintaining the presentation of the child. As it is the thinnest portion of the uterus at term, it is obvious that the uterus will tear most readily at this part.

The cervix during pregnancy is not altered in length. In consistence it changes greatly, becoming much softened as pregnancy advances. Its glands secrete a tenacious mucus, which forms a plug, effectually closing the cervical canal. As pregnancy advances the internal or external os dilates somewhat, in proportion as the patient is primipara or multipara.

The Broad Ligaments.—These important sheets of fascia which support the uterus, tubes, and ovaries, share in the general hyperemia of the generative tract. They become much more elastic than normal and the veins of the broad ligaments become enormously distended. At term these veins are often as large as the little finger, and obviously their rupture must be followed by alarming hemorrhage. They form dark-bluish masses at the sides of the lower part of the uterus, which illustrate the plethora of the free blood supply of the growing womb. Their distended plethoric condition renders them fit receptacles for infective bacteria.

The Vagina and Pelvic Floor.—During pregnancy this portion of the generative tract shares in the general hyperemia. The mucous membrane is engorged and dark reddish-blue in color and secretes a thick and acid mucus. Pulsation of the vessels can be plainly felt, the discoloration of the tissues extending to the external genital organs. The glands about the entrance to the vagina frequently secrete abundantly, and the veins about the external organs become distended, like the veins of the broad ligaments, and frequently are varicose.

The muscular and elastic tissues of the pelvic floor develop, becoming more elastic and vascular, and often thicker.

Changes in the Pelvis Incident to Pregnancy.—As the pelvis is composed of several bones united by joints, these joints share in the hyperemia of pregnancy. Synovial membrane and fluid develop in the sacro-iliac joints and in the sacro-coccygeal and pubic joints. Motion is greatly increased and may be sufficiently great to cause the patient discomfort, and to be readily perceptible upon examination. Rotation of the two halves upon the sacrum becomes possible, and considerable vertical movement of the two halves of the pubes. The coccyx becomes much more mobile upon the sacrum. In young women the bones of the pelvis increase somewhat in size and vascularity, and in young girls are considerably more elastic than normal. There is increased growth of cartilage in the symphysis pubis.

The Length and Axis of the Birth Canal in Pregnancy.—As the uterus rises in the abdomen and accommodates itself to the available space, it undergoes changes in its contour and position. In early pregnancy the body of the uterus is spherical, the uterine cavity being a round chamber. This gives sufficient space for the free movement of the embryo and fetus until viability is attained. After this the uterus is distinctly longitudinal, often flattened from before backward slightly, and unilaterally developed. The uterus rotates from left to right upon its axis, and at full term is usually found in what is called dextrotorsion. Its contour varies as pregnancy advances with the position and vigor of the fetus. It undergoes intermittent contractions during pregnancy in response to the stimulation and fetal movements

and impact, and can be distinctly felt to alter its contour as the fetus moves. Its size at term depends upon the size of the fetus, and the stature and development of the mother.

The position of the uterus as pregnancy continues depends in a considerable degree upon the firmness or elasticity of the mother's abdominal muscles and the condition of her abdominal viscera. In primiparæ with vigorous muscles the abdominal wall is symmetrically distended by the growing uterus, so that the abdominal tumor is not especially noticeable. In these patients the intestines and other abdominal viscera are held in normal position by normal ligaments, and the general shape of the patient's abdomen is not greatly altered.

In multiparæ who have repeatedly borne children the abdominal wall is greatly distended and elastic and the uterus frequently projects in a very noticeable manner. Where the patient has suffered from chronic ptosis of the abdominal viscera, when not pregnant, the growing womb may serve as a splint to carry upward and retain the prolapsed abdominal contents. In some cases this does not occur, and in spite of pregnancy the ptosis continues, and to the uterine tumor is added the prolapsed intestine or other viscus. In those who suffer from chronic toxemia, with accumulation of gas, this distention increases considerably the abdominal size.

The Posture and Attitude of the Pregnant Woman.—In the early months of normal gestation, the posture and attitude of the pregnant woman are practically unaltered. As pregnancy advances and the weight of the growing fetus becomes appreciable, the patient seeks to compensate for the size and weight of the abdominal tumor by throwing the shoulders backward and bending the upper spine backward. The shoulders are often squared as pregnancy advances to sustain the increased weight. In healthy women the patient stands erect throughout pregnancy, varying the curve of the spine to meet the indications present. In walking, the backward leaning of the upper part of the body is often especially noticeable.

The posture and attitude of the pregnant woman depend considerably upon whether she allows herself to grow normally during pregnancy, or whether she deforms herself by constricting clothing. In the former instance her general growth, and the adaptation of the trunk to the increasing

weight, lessen greatly the apparent size of the abdominal tumor. The pregnant condition is much less noticeable than in women who endeavor to hide it by constricting the waist and abdomen. In these patients the constriction may force the uterus down to the pelvic brim, but it will also interfere with intestinal peristalsis, causing distention of the bowel by gas, and increasing, if anything, the size of the ab-

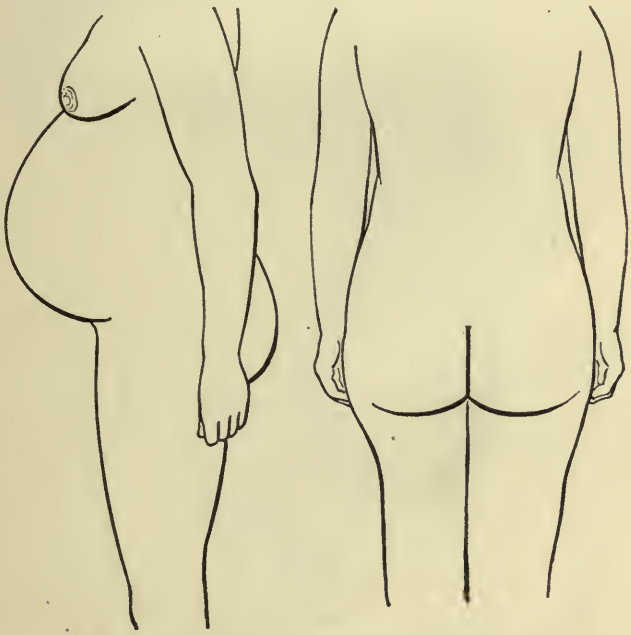

Fig. 14.—Contour, normal pregnancy, full term.

domen. In patients illegitimately pregnant, who endeavor to hide the condition by extreme pressure upon the abdomen and uterus, the womb may be so altered in shape as to be mistaken for a fibroid tumor or other pelvic or abdominal tumors.

The contour of the abdomen will depend somewhat upon the size of the child and the question of single or multiple pregnancy. The greater the weight within the uterus the

larger, naturally, must be the abdominal tumor. In some conditions of disease, notably polyhydramnios, the uterus may become so distended with fluid as to resemble a large ovarian cyst, giving the characteristic size and contour to the abdomen.

The Axis of the Birth Canal in Pregnancy.—The axis of the birth canal in pregnancy is the line which the fetus must

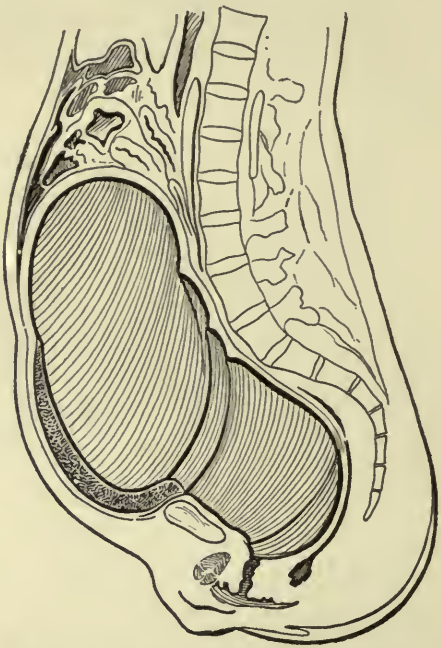

Fig. 15.—Normal birth canal, primipara.

follow to pass from the mother's womb to the external world. In normal cases this is virtually the same throughout pregnancy. The line in which expulsive force is exerted is directed from the fundus of the uterus downward and backward until the presenting part of the fetus, passing through the pelvis, meets the resistance of the posterior pelvic wall. Pressing against the concave surface of the sacrum and

upon the elastic muscular diaphragm of the pelvic floor it meets resistance from these tissues and seeks the point of least resistance. This is through the vagina at the vulvar opening. From the sacrum, coccyx, and pelvic floor, the line of force is directed forward and upward at an acute angle with its first direction, until the presenting part emerges at the bowel. The axis of the birth canal at term must be remembered in all obstetric operations which deliver the patient by traction through the vagina. If this line be followed in making traction, impaction of the presenting part will be avoided, and the mother will be delivered with the least injury to her and to the child.

CHAPTER V

THE GROWTH AND DEVELOPMENT OF THE EMBRYO

The embryo grows by the multiplication of cells through segmentation. This process begins with the passage of the ovum through the oviduct or Fallopian tube. The cells into which the impregnated ovum divide, separate into different layers or planes which have been traced to twelve segments. These continue to divide, until minute sub-division has developed. These cells have no membrane, a large, clear vesicular nucleus, while the granules in the yelk which surround

Fig. 16.—Human ovum of about twelve days (Reichert): A, side view; B, front view.

the genital spot in the ovum, are small, highly refractile, and almost round. As the ovum passes into the uterus it dilates until a bladder-like body closes the blastodermic vesicle. The outer layer of cells multiply and grow thinner, forming a clear layer known as the zona pellucida.

The Ectoderm, Endoderm, and Mesoderm.—The internal group of cells attaches itself on the circumference of the vesicle. Between the two layers forms a cavity called the segmentation cavity, or cavity of the blastoderm. The blasto-

dermic vesicle expands, containing fluid secreted in the wall of the vesicle, which derives its fluid from the abundant secretion furnished by the uterine glands. The inner thick mass of cells gradually separates into two layers—upper and lower, external and internal—called the ectodermic and endodermic. In the centre gradually develops a canal or line, called the primitive trace or notochord. Gradually three distinct layers of cells can be recognized, called respectively from without inward, the ectoderm, endoderm and mesoderm. These are virtually the outer, inner, and middle layers of embryonal cells.

The Growth of Organs.—The body is formed virtually from two epithelial tubes, one within the other. The branches of the inner tube produce many of the viscera, the space between the tubes forming the abdomen and thorax. The different organs of the body grow from layers of cells by the growing out or projecting of masses of cells, or by the folding in into cavities or crypts of masses of epithelium. It is important to know from what layer of cells the systems of organs in the body are formed.

From the ectoderm come the external organs of the body. Such are the skin or epidermis, and those structures which grow from it, or in it, such as the hair, the sebaceous and sweat glands, the salivary and mammary glands; also the epithelium of the cornea of the eye and the lens of the eye. As the external portion of the body brings us in relation with the external world, the nervous system, by which we gain knowledge of things about us, is formed from the external layer; also the organs of special sense, which are largely composed of nervous matter,—the eye, the organs of smell and hearing and taste in the mouth. The teeth also come from this layer with the skin. So does the pituitary body or hypophysis, and the epithelial tissue about the anus is naturally developed from the outer layer. The appendages of the fetus, the amnion, chorion and placenta come also from this layer.

The mesoderm, or middle layer, furnishes cells which produce the great epithelial membranes, peritoneum and pleuræ; also the organs of generation, which in the embryonal state are developed with the Wolffian bodies; and the kidneys as

well. Striped muscle comes also from this layer. From the cells of the middle layer also are developed the blood, its vessels, and the lymphatics; the spleen, fat cells and embryo, the unstriped muscle and connective tissue, and the bony skeleton.

The inner layer forms the viscera which have to do with digestion and assimilation and respiration; also the embryonal bladder or allantois and the primitive trace or spinal canal. So, for example, the trachea and lungs come from this layer, the thyroid, liver, stomach, pancreas and bowel.

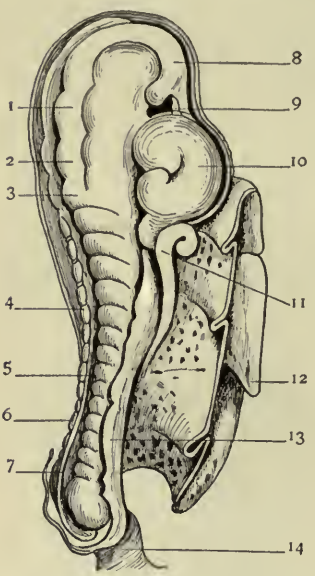

Fig. 17.—Embryo of 13 to 14 days; 1, mid-brain; 2, after-brain; 3, cerebellum; 4, amnion; 5 and 7, neural canal; 6, primitive trace; 8, fore-brain; 9, oval cavity; 10, heart; 11, vitelline canal; 12, vitelline membrane; 13, border of medullary plate; 14, allantois. (After Schultze.)

The Trunk of the Body.—In the centre of the embryo, like the keel of a boat, is a plate or layer of cells from the ectoderm, whose edges gradually turn upward, and finally close to form a tube. In these are developed the brain and spinal cord. Here gradually form the vertebræ and the spinal column.

The Circulation of the Embryo.—Nutritious matter is first carried by transudation or osmosis from the oviduct or Fallopian tube into the yelk substance of the ovum. This goes on after the embryo has been covered by the deciduous membranes. The embryonal heart may be recognized in the cervical region, and pulsates before the blood-vessels develop. The first fluid passing through the heart is without cells and clear. Embryonal blood and blood-vessels form in the vascular portion of the yelk substance outside the embryo. The first trace of blood-vessels is seen in channels formed in the

yelk area, which gradually develop toward the heart and become joined with it. The first blood-cells are formed where the vessels develop, gradually finding their way to the heart. They are red and nucleated, but as the fetus grows the blood corpuscles are formed without nuclei. Tubes of protoplasm comprise the first blood-vessels, which gradually separate into veins and arteries, the veins larger and thinner;

Fig. 18.—Embryo with open membranes, fifteen to eighteen days; 1, Allantois; 2, parietal mesoblast; 3, vitelline membrane, yolk; 4, amnion; 5, heart (after Coste).

the arteries smaller and thicker. By the end of the third month the blood cells have lost their nuclei.

The Wolffian Body and the Heart.—The Wolffian body is by most observers considered the embryonal or primitive kidney. It is formed of tubules from which the kidneys develop, and also Müller's ducts, from which the female genital organs are developed. Near the Wolffian body is an ele-

vated line of cells, from which, in both sexes, germinal elements develop.

The heart has already been described as a simple tube, at one end connected with the arterial vessels of the embryo, and joined at the other with the venous channels in the substance of the yelk.

The Allantois.—Before the development of an independent circulation in the embryo it obtains its nourishment from the yelk by a bladder-like body or vesicle, called the allantois. The mode of growth of this organ is not clearly defined, but

Fig. 19.—Embryo, third month; 1, Chorion; 2, amnion; 3, umbilical cord (after Schulte).

from it are formed the membranes which gradually surround the fetus, the amnion which is next the fetus, and the chorion which is next the uterus.

The Amnion and the Chorion.—The amnion next the fetus must be a perfectly smooth and delicate membrane to permit the free movement and development of the embryo and fetus. How the amnion forms is not clearly known. It contains no blood vessels nor nerves, is transparent, and formed by a network of connective tissue, with thin and transparent epithelial cells. It apparently permits the

transudation or passage of thin fluid, called the amniotic liquid.

The chorion next the uterus comes from the ectoderm and mesoderm and at first completely surrounds the ovum. In contrast to the amnion, which is thin, the chorion is thick and roughened by projecting tufts, called the villi. The tips of these villi enter the uterine deciduous membrane, and nutritious fluid passes through the decidua into the villi.

The Blood Vessels.—As the blood vessels are spread upon the red and fringed arches, known in the fish as the gills, so in the human embryo the large blood vessels, the beginning of the respiratory tract, and also the largest cervical nerves, are formed from the branchial arches. From these we may gradually recognize the curved form of the arch of the aorta and other great vessels. While the large vessels are developing, capillaries are forming among the embryonal cells which communicate with the venous extremity of the embryonal heart.

The First Distinct Circulation.—So soon as the chorion is fully formed and surrounds the ovum, it is termed the chorionic vesicle. Fluid accumulates within it, called the chorionic fluid. It is at first rich in vessels, receiving blood through the allantois from the embryo by two arteries—afterwards called the umbilical arteries—the blood returning through two umbilical veins. This is the embryonal circulation through the vessels, and marks a further step in development from the primitive embryonal circulation already described. The villi grow very luxuriantly until the embryo develops into the fetus, when most of the villi disappear, those remaining forming the placenta.

The Syncytium.—The villi of the chorion when closely studied are found to be covered with a layer of protoplasm with nuclei. This layer is called the syncytium and is of epithelial, or fetal origin. When the embryo forms the placenta, at about four months, a second layer of large cells with nuclei can be made out under the syncytium of the villi. This is also fetal tissue, known as Langhans' layer. During embryonal life the syncytium grows abundantly. The villi of the chorion bud and proliferate and project into the sinuses in the wall of the uterus. The capillaries of the villi are

under the epithelial cells of the villi and the capillary walls are formed by a single layer of endothelium. As the villi project into the mother's blood-channels there is, in the capillaries, a layer of endothelium and one of epithelium in the mother's tissues, between the fetal and maternal blood. It is obvious that a gas, such as oxygen, or very soluble substance,

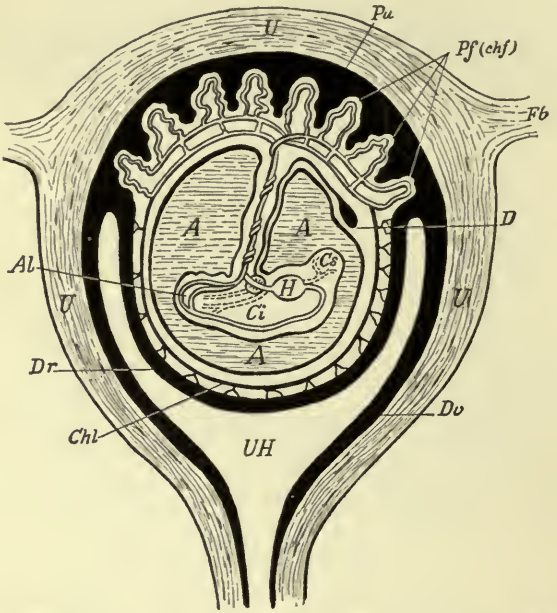

Fig. 20.—Section through pregnant uterus: *U*, Uterus; *Fb*, tube; *UH*, cavity of uterus; *Dv*, decidua vera which joins uterine placenta at *Pu*; *Dr*, decidua reflexa; *Pf*, fetal portion of placenta; *Chl*, chorion læve; *A*, amniotic cavity filled with fluid; *H*, heart of embryo; *Ci*, and *Cs*, inferior and superior vena cava; *Al*, artery allantois, umbilical artery; *D*, rudimentary allantois.

can pass from the blood of the mother into that of the embryo and fetus. The villi of the chorion with connective tissue and cells from the lining membrane of the uterus ultimately develop into the placenta.

The Embryo at Different Periods.—At the end of three or four weeks the embryo is enclosed in the chorionic vesicle.

It is curved considerably upon itself, a faint outline of the head can be made out, the neck is strongly bent, and the pedicle of the allantois is developing into the umbilical cord. By the end of the first month the body of the embryo can be plainly discerned and the rudimentary limbs are becoming longer; a faint outline of the human being can be made out in thirty-eight days; at fifty days the chin, nose and mouth can be plainly seen; the fingers are well developed, and the toes are beginning to lose their webbed condition. At two months, or sixty days, both feet are turned inward, the toes can be distinctly made out, and the arms and hands are directed upward toward the face. At seventy-five days the fetus can be recognized in the shape of a young child, its slender body, disproportionately large head, and the beginning of the nails, can be discerned. At three or four months, when most abortions occur, the eyelids of the fetus are closed, the chin is pointed, the nose and lips distinct, and the general bending of the body, known as flexion, has begun.

THE FETUS

The embryo ceases to be so called as the placenta forms between the third and fourth months. From this time the new being is styled the fetus.

The Size and Weight of the Fetus.—The average weight at the third month is 11 grammes; at the fourth month 57 grammes; the fifth month 284 grammes; the sixth month 634 grammes; the seventh month 1218 grammes; at the eighth month 1569 grammes; at the ninth month 1971 grammes.

The length may be obtained by Dührssen's rule, namely, to multiply the month by itself until one comes to the fifth month; after this, one continues to multiply the month by five. Thus at the end of one month the embryo is 1 cm. long, or 4.9 of an inch; at the end of the second month 4 cm., or $1\frac{7}{9}$ inches; at the end of the third month 9 cm. long, or 4 inches; at the end of the fourth month 16 cm. long, or $7\frac{1}{9}$ inches; at the end of the fifth month 25 cm. long, or $11\frac{1}{9}$ inches; at the end of the sixth month 30 cm. long, or $13\frac{1}{3}$ inches; at the end of the seventh month 35

cm. long, or $15\frac{5}{9}$ inches; at the end of the eighth month 40 cm. long, or $17\frac{7}{9}$ inches; at the end of the ninth month 45 cm. long, or 20 inches; and at the completion of pregnancy, its fullest term, 50 cm., or $22\frac{2}{9}$ inches.

To obtain the fetal length, the rule usually followed is to square the month of pregnancy up to the fifth; after that multiply the month by five.

Variations in Fetal Weight.—Many things influence the weight of the fetus. Abundant food for the mother or starvation, heavy and exhausting work, great mental anxiety, and in general, anything which depresses the mother and deprives her of strength, lessens the weight of the child. At between 30 and 35 years, the mother produces the largest children and the best developed. There seems to be some relation between the height and weight of the mother in the size of the child. Where the conditions for healthy children are good, the weight of the fetus increases with successive pregnancies; thus the fourth or fifth child might be from 2 to 5 lbs. heavier than the first child. The fetus grows most actively in weight from the fourth to the fifth month, when the weight should increase four-fold. This is when the placenta fully develops and the size of the placenta is in proportion with the child.

The Full-term Fetus.—It is often interesting and important to be able to state that a child is born at full term. This can best be ascertained by taking its full length and by the proportions which exist between the various parts of its body. Thus if the fetus at full term measures normally 50 cm., one-half of this plus 10, equals 35 cm., which will be the circumference of the chest at the region of the nipples. The head will be larger than the chest, the circumference of the cranium being 37 to 38 cm. When these proportions fail, or are reversed, the fetus is not at full term, or has been stunted by some disease or accident. At term the measurement around the fetal shoulders just below the acromial processes, should be fully 32 cm. A child born of healthy parents should not weigh less than 6 lbs. at birth. One can also judge concerning the development of the child by its plumpness and firmness, by the color and bright appearance of the eyes, and the vigor of its movements and cry, and by the strength and rhythm of the action of the heart.

It is difficult to tell exactly when the fetus is viable, but a fetus 26 weeks old has grown and lived. As an aid in estimating the growth of the fetus, the size of the mother's uterus at different periods of pregnancy, is of great value.

The development of the child may be divided into three periods: The first four months devoted to the growth of the various layers of cells forming the embryo and the organs derived from them, and these may be styled the period of development. The essential portions of the child are fully formed at the close of embryonal life.

The next period from the fourth to the seventh month, is the time of growth, when the fetus increases rapidly in size.

From viability at about the seventh month to birth at full term, the fetus does not grow so much in length as in weight, and this may be termed the period of ripening.

The Fetal Circulation.—This somewhat difficult subject may perhaps be best understood if one follows the blood from the placenta through the umbilical vein which contains oxygenated blood, entering the body at the navel or umbilicus, and running from thence to the posterior border of the liver. Here it meets the hepatic portal vein, bringing blood from the bowel of the fetus. Reaching the liver, a portion of the blood goes through the afferent hepatic vessels into the liver, and through the hepatic veins to the posterior vena cava. The greater part of the blood passes through the wide ductus venosus into the posterior vena cava without going through the liver, and thus reaches the heart. This blood contains more nutritious matter and more oxygen than the blood returned by the anterior vena cava, and also has less nitrogenous waste material from the fetus. It is practically arterial blood. This blood through the posterior vena cava does not enter the right auricle, but passes by the Eustachian valve through the foramen ovale into the left auricle, and here it receives a very small quantity of blood coming through the pulmonary veins from the unexpanded fetal lungs. From the left auricle the blood passes into the ventricle, thence through the aorta into the carotids and subclavians to the heart and arms. The blood pressure in the fetal circulation is such that but very little of this blood enters the dorsal portion of the aorta, for this vessel already contains blood from

the right ventricle through the ductus arteriosus. The walls of the two ventricles, equal in strength and thickness, force the blood from the right ventricle along the aortic arch, while the blood from the left ventricle is carried backward along the dorsal aorta, thence descending it passes to the lower limbs and nourishes the inferior portion of the fetal body.

As the fetal lungs are not unfolded, and as respiration has not occurred, the right ventricle of the heart and dark blood passing thence through the pulmonary trunk, passes in small portion only to the tissues of the lungs. The greater part of the venous blood from the right heart passes through the ductus arteriosus to the aorta and down to the common iliacs to the lower extremities, and thence through the umbilical or allantoic arteries to the placenta,where it receives oxygen and nutritious matter, and returns through the umbilical or allantoic vein. The ductus arteriosus is a channel which prevents the greater part of the blood from passing to the lungs, where it is not needed, and carries it into the aorta; while the ductus venosus conveys the pure blood from the placenta into the posterior vena cava without passing through the liver. In the fetus the right auricle receives blood from the anterior vena cava, the coronary sinuses, and the posterior vena cava; the left auricle by the Eustachian valve, from the foramen ovale, receives the blood from the posterior vena cava; the anterior vena cava brings from the head and arms the venous blood; the posterior vena cava the blood from the posterior part of the body, the lower limbs and kidneys, and also from the placenta, intestine and liver.

The fetal circulation cannot be understood without remembering that while the fetus is within the uterus and the placenta is attached to the mother's uterus, that the functions of oxygenation and respiration, as performed by the lungs, and the changes in the blood normally performed by the liver, are reduced to their lowest terms during intrauterine life. The mother breathes and assimilates for the fetus by means of the placenta; hence the blood from the placenta is sent in very small portion only to the liver and to the lungs, and the two channels provided for this purpose are respectively the ductus venosus and the ductus arteriosus.

It is obvious that if the aorta was to be obliterated just in

front of the point where the ductus arteriosus enters, that the fetus could live until it was separated from the mother; then its further existence would become impossible.

The Changes in the Fetal Circulation at Birth.—The expulsion of the child from the uterus, so long as the placenta remains attached, does not greatly alter its fetal conditions. It frequently breathes but very little until the placenta separates and the lungs gradually expand. When this occurs the placental circulation ceases, the vessels in the umbilical cord become plugged, the lungs open, blood passes freely into them, the Eustachian valve is gradually pushed against the foramen ovale and closes it, and the ductus arteriosus and ductus venosus are closed and gradually shrink, while the umbilical arteries or allantoic vessels are gradually obliterated. These changes cause the blood from the anterior and posterior vena cavæ to pass from the right auricle to the right ventricle, thence as the ductus arteriosus is closed when the right ventricle contracts, the blood cannot enter the aorta but passes along the pulmonary arteries to the lungs. From the lungs it enters the left auricle from the pulmonary veins, thence to the left ventricle, which forces it, as in the adult, to the head of the upper and lower extremities.

The shutting off of the ductus venosus sends the blood in the hepatic region through the capillaries of the liver to the posterior vena cava. The closing of the two ducts and of the foramen ovale changes the circulation of the fetus to that of the adult individual. This process is gradual, occupying from ten days to three weeks, the allantoic or umbilical arteries first becoming occluded, then the umbilical veins and ductus venosus with the ductus arteriosus.

The most important of all changes, so far as the health of the child is concerned, is the closure of the foramen ovale. At first the edges of the valve are kept closely applied to the margins of the opening by blood pressure. Later the valve seems to adhere or grow into the septum of the heart. Should this junction be imperfect, venous and arterial blood will mix, the color of the child will be partly cyanotic, and the baby is often called a blue baby. Such a child develops feebly and is always in danger of death through engorgement of the lungs and overdistention of the heart.

THE FETAL APPENDAGES

The Umbilical Cord.—The beginning of this cord, which connects the fetus with the placenta, is found in the stalk of the allantois. This sac—the allantois—is a diverticulum or offshoot from the embryo. The cord is not covered by amnion, which develops at the sides of the umbilical cord but does not extend upon its surface. If the stalk of the allantois be cut across it is seen to consist of connective tissue with branching cells derived from the ectoderm and mesoderm. Its blood vessels become more or less thick by the growth of cells lining their walls. At full term the cord is twisted in spirals from left to right, whitish in color because of the presence of embryonic connective tissue, called Wharton's jelly, and varying greatly in length. It is narrowest at the fetal end where the epidermis of the fetus grows upon the cord for a short distance. It joins the chorion at the placenta. Where the cord terminates outside the centre of the afterbirth it becomes united with the chorion, forming a membranous insertion, called velamentous. The external surface of the cord is covered with epithelium, which is continuous with the amnion, and which covers Wharton's jelly. When the fetus is developed it contains two arteries, the umbilical and one large vein in the centre, the umbilical vein. The cord is without nerves, lymphatics or capillaries, and the arteries contain no elastic tissue, but muscular tissue and intima lining. There seems to be no explanation for the varying length in the cord, nor for the different quantity of Wharton's jelly often found; thus some cords are so thick

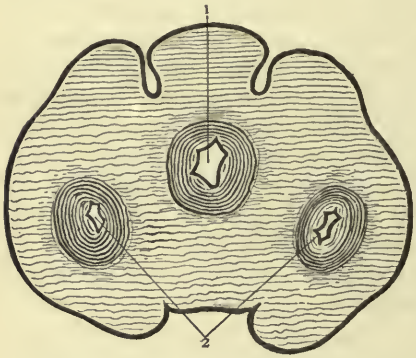

Fig. 21.—Cross-section of umbilical cord at term: 1, umbilical vein; 2, umbilical arteries.

that they are tied with difficulty, because of the great quantity of Wharton's jelly present, and in some cases this must be pressed out from the cut end before a ligature will hold. As the arteries possess a thick muscular coat they must be firmly tied to be completely closed. If this be not done the ligature may slip, and hemorrhage, dangerous or fatal to the fetus, may result. The cord is peculiar in that oxygenated blood is carried from the placenta in the umbilical vein, while impure blood containing the waste material of the fetus is carried in the two umbilical arteries.

The Placenta.—The placenta or afterbirth is called in Germany, the mother-cake or Mutter-kuchen. It is ordinarily as large as a large saucer or tea-plate. It is from half an inch to an inch and a half thick, resembling raw meat in color, and divided into small lobes or portions, called cotyledons. It varies in size with the development of the child. At its edges it grows thin, joining with the amnion and chorion, which are attached around the edge of the placenta. These membranes form a bag containing the fetus and the amniotic liquid.

If one examines the placenta closely between the cotyledons there will be seen areas of flesh-colored or pale yellow. These are the villi which can be seen through the chorion. At the placenta the blood vessels of the cord divide minutely, the arteries remaining on the surface, and the veins going more deeply but without anastomosis. On the uterine surface of the placenta can be demonstrated a soft membrane, light-grayish in color—the placental decidua or decidua serotina. At childbirth this is divided into two parts. If the placenta be examined in sections, it contains masses of twigs or branches which grow out of the chorion and are developed from its villi. The spaces between the villi form the blood channels of the placenta, into which open the arteries and veins of the placenta.

The placenta is applied to the wall of the uterus but is rarely if ever adherent. It follows the wall of the uterus when the womb contracts, as it is convex, being fixed in the centre and growing thin toward the edges. The placenta is applied to the wall of the uterus by the pressure of the amniotic liquid and by the property possessed by living membrane

of adhering to other living tissues. The placenta is often said erroneously to be adherent, but such is never the case unless some pathological process has changed the uterine decidua and the placental decidua as well.

The Circulation of the Placenta.—How nourishment passes from mother to child in the placenta is not known. There is no evidence that the circulation of the mother and child connect directly. The process seems one of osmosis or the passage through a membrane, and the spaces between the villi are undoubtedly from the first development of the embryo the channels for the mother's blood. By some it is held that material passes from mother to fetus by the transfer of masses of leukocytes in the channels of the placenta.

The uterine decidua gradually disappears as pregnancy advances, thus bringing the placental villi into close relation with the mother's blood channels. The fetal membrane joins with the connective tissue in the uterus and derives nourishment from the uterine capillaries.

The placenta has been termed by some the gill of the fetus, as it permits the oxygenation of its blood as the red fringes in the gill of a fish are formed by the small blood vessels of the fish. It is evident that if the substance of the placenta be altered by disease that the oxygenation of the fetal blood will suffer, and hence those diseases which greatly alter the tissues of the placenta result in fetal death. As the stem of an apple undergoes changes when the fruit is ripe, so the human placenta is altered as pregnancy draws toward its close. Whitish deposits are seen throughout the placenta in some cases where the excretion of the mother is greatly altered. This destroys the circulation of the mother at that point and may indirectly cause the death of the fetus through asphyxiation. So syphilis, which causes changes in the placenta, frequently destroys fetal life. There is evidence that soluble substances pass from mother to child through the placenta and that bacteria may also reach the fetus through the mother's circulation. The cells of the placenta have also the function of forming complex albuminoid substances, some of which act as antibodies against diseased products coming from the fetus. The placenta then is not simply an organ for oxidation, but also an organ of assimilation, playing an important part in fetal and maternal metabolism.

PART II

PREGNANCY

CHAPTER VI

PREGNANCY

As the fetus grows it assumes relation to the body of the mother. In early pregnancy when the uterine cavity is globular the fetus moves freely in all directions. As it increases in size the uterus loses its globular form, becoming lengthened, and the movements of the child are restricted.

Fig. 22.—Flexion.

Fig. 23.—Extension.

Probably by the force of gravity the heaviest portion of the fetus is usually lowest in the uterus and comes to the internal os. The long axis of the fetus coincides with the long axis of the womb. That portion of the fetus which presents at the mouth of the uterus is naturally called the *presenting part,* and its location brings about what is known as *presen-*

tation. Presentations are named in accordance with the fetal part which presents, thus, there are, when the head is lowest, vertex, brow and face presentations of the head. As the long axis of the fetus must correspond with the long axis of the uterus, the breech or inferior extremity of the fetus may in some cases present.

If the fetus be turned transversely across the womb, the shoulder presents.

Fig. 24.—First position, vertex.

It must be remembered that presentation applies to the fetus and not to the mother.

Position.—The relation which the fetus bears to the mother is called its position. Under ordinary circumstances the head of the child being lowest and presenting, its back is directed toward the left side of the mother's abdomen. This is termed the first position. When this is present the head may present or the breech may present, but position applies

to the relation between the body of the fetus and the mother. Less often the back is turned toward the right side of the mother, when a second position of either head or breech may be present.

Occasionally abnormal positions and presentations develop. Thus the child may be across the mother's womb, the shoulder presenting, or the child may be oblique in the mother's womb and the brow presenting. There are also

Fig. 25.—The head engaging and descending. Second position vertex presentation.

complex presentations where one or both arms may be in front of the child's head, or where the legs may present in front of the breech.

Engagement.—The term engagement has to do with the entrance of the fetus into the mother's birth-canal. As the purpose of pregnancy is to give birth to a living child, and the child must pass through the pelvis to be born, the question of engagement becomes of great importance. The pre-

senting part, whether head or breech, is said to engage when it enters the pelvis. It must not only be in the pelvic brim, but descend through the brim to the cavity of the pelvis to really engage. As this is one of the most important conditions in the development of labor it is obviously essential that a physician should be able to recognize if engagement has taken place. If engagement does not develop at the beginning of labor, then naturally birth is impossible. There is some abnormality present and interference and often operation becomes necessary. If the physician attempts to drag the child down into the pelvis, and through the pelvis, without engagement, the death of the child frequently follows. Such deliveries are accompanied by considerable injury to the mother.

If the fetus be turned across the uterus and pelvis it is evident that no true engagement can develop. The fetus may be wedged into the pelvic brim, but it cannot pass through. It is then said to be impacted.

CHAPTER VII

THE DIAGNOSIS OF PREGNANCY

No subject in medicine is more difficult in some cases, and more important, than the diagnosis of pregnancy. If pregnancy be present and it be not discovered, the patient may be operated upon for some condition which is supposed to be present, but which is absent, or may be treated for some disease which she does not have. Thus, the abdomen has been opened supposedly for a fibroid tumor of the uterus when pregnancy was present, and patients have been treated for gastritis when this condition was not present but when the patient was pregnant. Such errors in diagnosis may injure the reputation of the physician and also that of the patient. Unmarried women may be suspected wrongfully of illegitimate pregnancy, and by a false diagnosis such women may be subjected to operation and the pregnancy discovered and made public by the operation. In the case of married women unnecessary operation or improper treatment may cause abortion if pregnancy is not recognized. Most mistakes in the diagnosis of pregnancy occur because the physician does not follow a systematic plan in studying the case. It is important that the student should recognize this fact and that he should examine his patients by a uniform method.

THE HISTORY OF PREGNANCY

It is usual in diagnosticating disease to first obtain the statements of the patient or of those who know concerning her health. When normal pregnancy is present the patient will state that menstruation has entirely ceased or has become greatly lessened. In a patient who has always been regular this fact is of considerable importance. Next often the patient will describe disturbance of the stomach, more or less severe. This will usually be said to occur on waking in

the morning, often not returning during the day. There is a desire to empty the stomach, and a varying quantity of sour or acrid mucus and fluid is ejected.

In addition to the cessation of menstruation and disturbance of the stomach the patient will describe disturbance in the skin, and especially in the mammary glands. The breasts will be said to be enlarged and unusually tender with shooting or pricking sensations through them. The nipples may be unusually sore, and pressure of clothing may give the patient considerable annoyance. As pregnancy proceeds it will be noticed that the abdomen is growing large, that the functions of the bladder are disturbed, and that the bladder must be emptied more frequently than usual. Constipation sometimes is reported, and occasionally diarrhea. Loss or increase of appetite, and improvement in the general health or considerable disturbance, are commonly noted.

At about the fourth month of pregnancy the patient will describe the first movements of the fetus. This sensation is usually compared to the fluttering of a young bird in the hand. As the fetus grows its movements will become more distinct and vigorous, until at full term they may be sufficiently strong to give the mother considerable pain. The mother may also complain of a whitish vaginal discharge.

While this is a history of normal pregnancy, it must not be forgotten that all these symptoms may be described by a patient who is not really pregnant. In the condition known as false pregnancy, or pseudocyesis, the sensations experienced in pregnancy are present, but they arise from a disordered nervous condition and not from actual gestation.

In studying cases the history should always be obtained first from the patient. It should at least put the physician on his guard as to the existence of pregnancy. It often relieves the patient's embarrassment if she describes her symptoms, and this narration gives the physician an opportunity as he listens to the history to observe the patient carefully. Occasionally the symptoms of pregnancy are accurately described by a woman who is not pregnant, but who is vicious and who attempts blackmail.

On the other hand, the patient may not suspect the pregnancy, and may in good faith describe symptoms of preg-

nancy which to her indicate some diseased and abnormal condition. In such cases the physician must receive the history attentively, and as symptoms of pregnancy are disclosed he must, while accepting the history, make no diagnosis until he has made a physical examination. In studying a case of pregnancy the history should be noted, record being made of the last menstruation and its duration, and the time when life was felt, if such has been the case. It is important in obtaining the date of the last menstruation to know whether this period was a perfectly normal one. If it occurred at the usual time and was considerably less in quantity, conception may have occurred just before this period. These salient facts concerning the case should be kept on record.

PHYSICAL EXAMINATION IN THE DIAGNOSIS OF PREGNANCY

Before proceeding to examine the generative organs a general physical examination of the patient should be made. The condition of the face and eyes should be noted, as the face may be flushed or discolored if pregnancy is present; so the condition of the eyes is important, as pregnancy is sometimes complicated by exophthalmic goitre. The thyroid gland must be palpated. Very commonly the thyroid is enlarged moderately in early pregnancy, and this condition has by some been thought to be a sign of clinical value.

In examining the chest the mammary glands should be inspected. If pregnancy is present in primiparous patients they will be enlarged after the first few weeks, tender to palpation, and around the nipple will be a circular area of more or less pigmented tissue. In blonde patients the discoloration is slight, and in brunettes it is very pronounced. Small follicles surrounding the nipples will be enlarged and distinctly raised above the surface. The nipple itself will be somewhat darker and sensitive. Sometimes the lymphatic glands in the axillæ are also enlarged. Gentle pressure upon the breasts will frequently cause fluid to issue from the nipples.

On listening to the heart it will be noticed that its action is unusually disturbed and that the circulation is very sensitive to excitement. In anemic patients indistinct mur-

murs are often heard over the heart. The examination of the abdomen is important because it may reveal the enlarged uterus. This is rarely felt before the fourth month unless the abdominal wall is unusually thin and elastic. At the fourth month the uterus is a globular tumor extending slightly above the pubis. Pressure on each side of the uterus may elicit pain because the ovaries are often unusually tender. If the abdomen be inspected in the later months of pregnancy the abdominal tumor is evident, and in the last months the abdomen may be pigmented, and the white and somewhat shining stripes upon the abdomen caused by the separation of the superficial fascia, may also be observed. In later pregnancy the lower extremities may be somewhat swollen, while in healthy patients the general appearance of the body is that of good health and physiological plethora.

THE DIAGNOSIS OF PREGNANCY BY PELVIC EXAMINATION

This is the only method in the early months of gestation which the physician can apply to the solution of this difficult subject. So important an examination must be made carefully and thoroughly, and with as little disturbance to the patient as possible. The examination which has preceded should have made the patient more at her ease with the doctor and have prepared the way for the internal examination. Out of deference to the patient's feelings, and as a protection to the physician in dealing with unprincipled women, a third person, a relative of the patient or a nurse, should be present at the examination. The patient should be in proper condition for such an examination. The bladder should not be distended with urine, nor the abdomen greatly distended with intestinal gas. The patient should be in a comfortable posture, lying upon the back or side, the urinary bladder should be emptied, and if possible the bowels should have been moved thoroughly before the examination. The patient should not be chilled and unnecessary exposure should be avoided.

The physician should render his hands thoroughly clean and warm, and preferably should use sterile rubber gloves. While unquestionably gloves somewhat deaden the sensi-

bility of the finger-tips, still they are so great a protection to the physician against syphilitic and other infection, and a safeguard to the patient against septic infection, that they should be employed. An antiseptic solution should be used to cleanse the external parts of the patient and also to disinfect the physician's hands.

If the vulva be inspected during pregnancy it will be found somewhat discolored and often enlarged, the veins are visible. On vaginal examination it may be noticed that the vessels in the vagina are pulsating strongly, and the cervix will be found invariably softened in pregnancy. The degree of softening will depend upon the primiparity or multiparity of the patient and the general condition of her tissues. If the patient has been pregnant a number of times the cervix may have been repeatedly torn and its edges thicker and considerably firmer than normal. Softening in such a cervix is not present in a great degree. On the other hand, in primiparous women the pregnant cervix is often as soft as the lips.

In examining the cervix the physician must also note whether it is in any degree dilated. In first pregnancies it is closed by a plug of mucus secreted by the cervical glands. If the patient has had a number of children previously the external os will be opened and may readily admit one or even two fingers.

The most important step in the diagnosis of pregnancy is the study of the contour of the uterus as made by vaginal examination. Having observed the position and the condition of the cervix, the examining finger should then be placed upon its anterior surface, and the condition of the body of the uterus above should be studied. If pregnancy is present the body of the uterus will be enlarged and spherical. This might arise from other causes than pregnancy, but if gestation is in progress the lower uterine segment, the elastic tissue between the body and the cervix, will be developed sufficiently to permit its recognition by the finger. If the fingers be placed upon the anterior surface of the cervix and carried upward and slightly backward, the elasticity of the lower segment will be appreciated and the lower edge of the upper expulsive segment will be found as a ridge or rim above the fingers. The shape of the uterus will resemble

that of a round-bodied jug inverted, the neck of the jug corresponding to the cervix, the body of the jug resembling the body of the uterus, while the lower segment will be the groove between the body and the neck. Especial care must be taken to identify the lower segment and the globular upper segment of the uterus. Upon this recognition depends the diagnosis of early pregnancy.

Occasionally patients are so sensitive to examination that a satisfactory vaginal investigation cannot be made without anesthesia. If it is imperative to make a decision concerning the existence of pregnancy, anesthesia may properly be employed.

In some multiparous women the lower segment is very difficult to recognize in early pregnancy. It may be necessary to defer a positive diagnosis in such cases and to examine the patient several times at intervals of two or three weeks. Repeated examination will rarely fail to give the necessary information.

While diseased conditions of the uterus may cause enlargement of the body of the womb, and while the globular shape may be present in some cases of fibroid disease, the lower uterine segment does not develop in any condition except pregnancy. Its recognition becomes therefore of the greatest importance.

The vaginal examination should also be utilized to observe the presence or absence of any abnormal condition in the pelvis. In ectopic pregnancy the characteristic changes in the uterus may be present to some degree, but the position of the ovum may be inferred from the tenderness elicited when pressure is made in the vicinity of the Fallopian tube, where the ovum has remained. In such a case, while the diagnosis of ectopic pregnancy may not be positively made, suspicion should be aroused and the patient watched accordingly.

THE DIAGNOSIS OF LATER PREGNANCY

After the fourth month the positive diagnosis of pregnancy by vaginal examination becomes less difficult. By abdominal palpation the fundus can usually be felt above the pubis, and at the sixth month some idea can ordinarily be gained con-

cerning the position of the fetus. At the seventh month the diagnosis is usually possible by hearing the fetal heart sounds, outlining its body, and observing the movement of the fetal limbs. When this can be done distinctly a positive diagnosis of pregnancy can be absolutely made. Prior to this, while a probable diagnosis may be given, it cannot be positive.

At full term a complete diagnosis of pregnancy must embrace not only its existence, but the position and presentation of the fetus, the period of gestation, the location of the placenta, the size of the mother's pelvis, her primiparity or

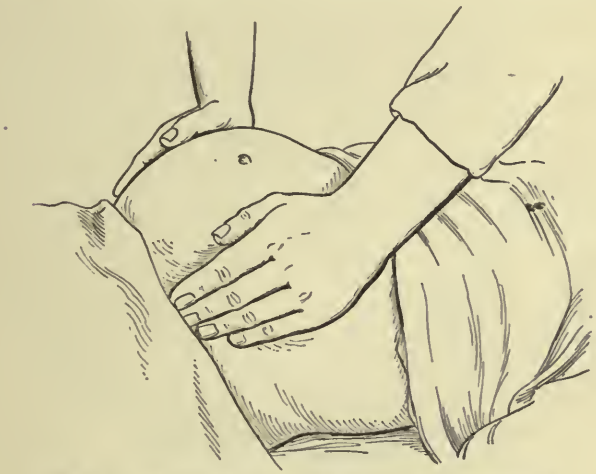

Fig. 26.—Outlining the fetus by abdominal palpation.

multiparity, and the comparative size of mother and child. To this should be added the condition of the mammary glands. For a complete examination the patient must lie in a comfortable position on her back, on a bed or table. While it is customary to expose the abdomen this is not absolutely necessary, and one thickness of soft linen is not an obstacle to an accurate diagnosis. The head and shoulders of the patient should be raised sufficiently to relax the abdominal walls. The physician requires for such an examination a stethoscope, a pelvimeter, and a steel tape-line. Notes should be taken of various data which the examination discloses.

The position and presentation of the child should first be made out by palpation. To practice this the physician's hands must be thoroughly cleaned and warm, not only as a matter of neatness but also that the fingers may be as sensitive as possible. Standing with his back toward the patient's face the entire hands are placed on each side of the abdomen and sufficient pressure is made to outline the body of the child. Greater resistance on the left or right side will indicate that the back of the child is directed toward the left or right side of the mother. By making gentle pressure upon the

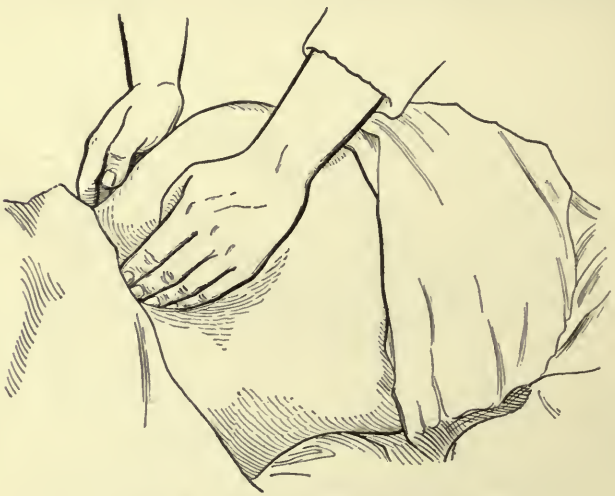

Fig. 27.—Palpating the presenting part.

upper portion of the abdomen the thighs, knees and legs of the fetus can often be detected. By carrying the pressure downward to the brim of the pelvis it is usually possible to outline the head and to observe the groove or depression between the head and the body, which indicate the neck. If the patient's tissues are thin, and the examiner is experienced, he can often diagnosticate the presentation of the head which is present. Usually the vertex is lowermost and by palpation the sides of the head are felt.

It is of especial importance to determine the presence or

absence of engagement of the presenting part. If the head be freely movable at the pelvic brim there is no engagement whatever. If the head be slightly movable at the pelvic brim it may have entered the upper portion of the pelvis, but not have completely engaged. Complete engagement when present removes part of the head from the pressure of the examining hands. The physician feels but that portion of the head which is above or just beneath the pelvic brim. The head is immobile or very slightly movable and it is impossible to outline the rounded shape of the dome of the cranium. Usually the position of the head can be determined and the fact that the vertex is directed toward the left or the right side.

No examination in obstetrics is so important as the detection of the presence or absence of engagement of the presenting part. If this be obscured by the fulness of the patient's urinary bladder, it must be removed, if necessary by the use of the catheter. Palpation at the pelvic brim is usually more successful if the abdominal muscles be relaxed, and to secure this the patient should bend the thighs upon the body.

Having noted the position of the back, the presenting part, and its relative position, the examiner should face the patient and palpate the upper portion of the abdomen and the fundus of the uterus. Usually the breech can be made out, as it is more hard, round and distinct than the head. In breech presentation the head will be found at the fundus and the breech at the pelvic brim, and palpation will usually detect the difference in the two fetal extremities.

In addition to position and presentation, palpation should give valuable knowledge concerning the condition of the uterine muscle and the general vigor of the patient. In a well-nourished primipara palpation finds the uterus firm and elastic and often contracting slightly under examination. In a relaxed and anemic multipara the muscle of the uterus is less firm and less vigorous, and the abdominal wall is also relaxed and distended. By palpation the examiner gains a good idea concerning the strength and elasticity of the muscle of the uterus and of the abdominal muscles as well. He will also observe the condition of the intestine. If the bowels

are relaxed and distended with gas this will obscure palpation and furnish another indication of the lack of vigor in the patient. If the bowels are contracted and gas in large quantity is not present, it will indicate a more normal and vigorous state.

Palpation should also give evidence of multiple pregnancy. If two heads, for example, can be palpated it is probable that twin pregnancy is present. The presence of a monstrosity is possible, but not usual.

RECOGNITION OF UNUSUAL POSITIONS AND PRESENTATIONS

Transverse position and shoulder presentation of the fetus may be recognized by palpation. The head will be found at one side, usually in the left iliac fossa, the breech and limbs at the right, the back and shoulder at the pelvic brim. Should the back be posterior the arms and hands will be in front.

Oblique positions of the fetus through some abnormality which prevents the descent of the child, may also be recognized. Failure of flexion, producing face or brow presentation and lateral partial rotation of the head, which results in parietal bone presentation, may be detected by palpation in patients with thin tissues.

POSITION

The simplest and most rational idea of position is that which makes two—the first position, in which the back of the child and the presenting part are directed toward the left side of the mother's abdomen and pelvis; and the second position, in which the back and presenting part are directed toward the right. Posterior positions of the back and presenting part are most rationally considered as abnormal rotations, and this conception aids in studying labor.

MULTIPLE PREGNANCY

In palpating more than one fetus, a positive diagnosis of multiple pregnancy cannot be made by palpation unless the examiner can clearly outline two fetal heads and one breech, or one head and two breeches.

FETAL MOVEMENTS

During palpation the disturbance caused usually produces fetal movements. These are of two kinds, the folding and unfolding of the fetal body, comparatively slow gradual movements, and the sudden rapid motion of the knees and elbows, which indicate movements of the fetal limbs. The larger movements are felt upon the left or right sides of the mother's abdomen, the quick and sharper motions on the right side, above and below, or on the left side above and below.

AUSCULTATION

While the recognition of movements indicates that the fetus lives, hearing the fetal heart beat proves its existence. This is heard more commonly on the left side of the mother's abdomen, midway between the umbilicus and the anterior superior spine of the ilium. Should the position be second the fetal heart sounds will be heard at the corresponding position on the right side. As the child enters the pelvis the heart sound is lower. If the back of the child is posterior the heart sound is less distinct. When the breech presents the heart sound is upon the left or right side at the level, or above a line drawn transversely through the umbilicus. In shoulder presentation transverse position, the heart sound is in the centre above the pubis. In abnormal positions and rotations it may be heard low at the sides of the abdomen.

While some prefer to use a stethoscope, the heart sounds can be heard more accurately and quickly by placing the ear against the abdominal wall, covered with one layer of thin linen. Some prefer the phonendoscope to detect heart sounds.

The Placental Sound.—The blood passing through the large uterine sinuses where the placenta is attached gives rise to a beating, hissing sound called the placental bruit. It is nearly synchronous with the mother's pulse, slower and sometimes louder than the fetal heart, and covers a larger area than the fetal heart. It is best recognized by listening while the observer takes the radial pulse of the mother and identifies the two as maternal and not fetal sounds.

When the placenta and the back of the child are upon

the same side of the uterus the placenta may obscure the fetal heart sounds. The diagnosis is then made by failure to find a fetal heart sound elsewhere, by locating the fetus by palpation, and by pressing the ear gently into the abdominal wall, when the fetal heart sounds will become evident as well as the placental sound.

Abnormal Sounds.—The hissing rapid sound, a little slower than the fetal heart, and more rapid than the placental

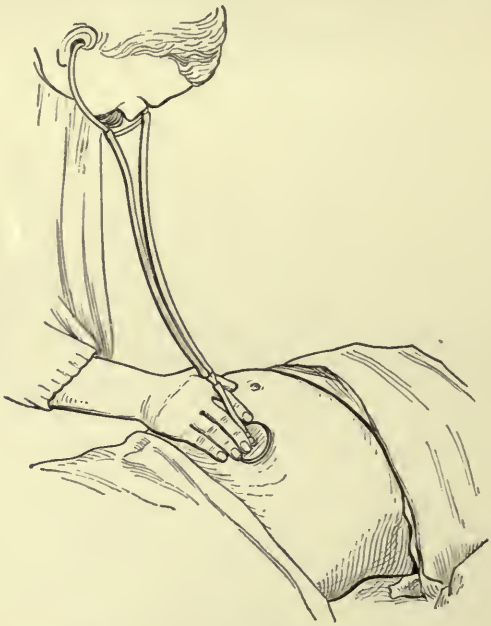

Fig. 28.—The fetal heart sounds.

sound, indicates a murmur in the umbilical cord coiled about the child. Two or more distinct heart sounds are signs of multiple pregnancy. Gas in the intestine of the mother and a very strongly beating maternal aorta may confuse the examiner.

Prognosis by Auscultation.—No definite prognosis concerning sex or the vigor of the fetus can be made by auscultation.

If the heart sound is more rapid than 140 the fetus is probably female; if slower than 140 probably male. Experience will enable the physician to recognize the heart sound as of average or greater strength. During labor, birth pressure or maternal hemorrhage may cause the fetal heart to beat at first more rapidly, then slowly, weakly, and faintly, indicating danger to fetal life.

Fetal movements are sometimes appreciated by the ear, as the limbs strike against the walls of the uterus. In threatened asphyxia these movements may become rapid and violent for a short time.

THE MEASUREMENT OF THE PELVIS

In the living patient the pelvis is measured by external and internal pelvimetry.

External pelvimetry is done by calipers called a pelvimeter. For this the patient lies upon her back, with the abdomen, pelvis and upper thighs covered by one thickness only of thin linen. The physician then measures between the anterior superior spines, normally 24 to 26½ cm.; between the outermost crests, normally 28 cm.; between the trochanters and the femora, normally 32 cm. These are measures of width at the pelvic brim.

The patient is asked to turn slightly upon her right side, raising the left hip. One limb of the pelvimeter is then placed on the posterior superior spine of the left side, the other upon the anterior superior spine of the right side. This measurement, the *left oblique diagonal*, is normally 22 cm. The patient is then asked to turn upon the left side, when the pelvimeter is placed upon the right posterior superior spine and the left anterior, measuring the *right oblique diameter*, 22½ to 23 cm. The patient should then lie upon the left side with the thighs very slightly flexed or almost extended, the body raised squarely upon the left shoulder, side, hip and thigh. Passing the fingers down the spinous processes of the vertebræ the physician comes upon the depression beneath the spine of the last lumbar vertebra. This may also be located by sight, by exposing the posterior surface of the sacral and lumbar regions, when

two depressions or dimples will be noticed, one on each side of the line of the spine. If an imaginary line be drawn between them transversely, the spine of the last lumbar vertebra will be found just above the centre of this line. The pelvimeter should be placed in the depression beneath the spine of the last lumbar vertebra and its other limb on the middle of the pubes in front. This gives the external antero-posterior diameter 20½ cm. The circumference of the pelvis is obtained by placing the patient upon her back and meas-

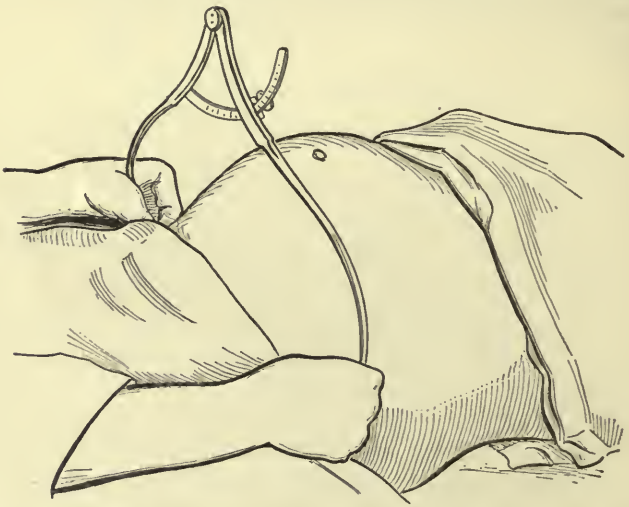

Fig. 29.—Obtaining the transverse diameter of the pelvis by external pelvimetry.

uring with a tape-line around the pelvis just below the crests of the ilium—85 to 90 cm.

At the pelvic outlet the distance between the tuberosities of the ischia may be measured with the pelvimeter or a tape-line, by turning the patient upon her side, or by having an assistant raise the thighs perpendicularly and support the knees. This distance is ordinarily 11 cm.

Internal Pelvimetry.—This may be done by the hand or by instruments; usually the hand suffices. The most impor-

tant measurement is that from the lower border of the symphysis to the promontory of the sacrum. To accomplish this the patient must be upon the back with her hips projecting slightly over the bed or table. The legs and thighs must be flexed and supported. The hands of the examiner should be made sterile, or covered with sterile gloves. The hands, gloved or ungloved, should be thoroughly warmed, and the

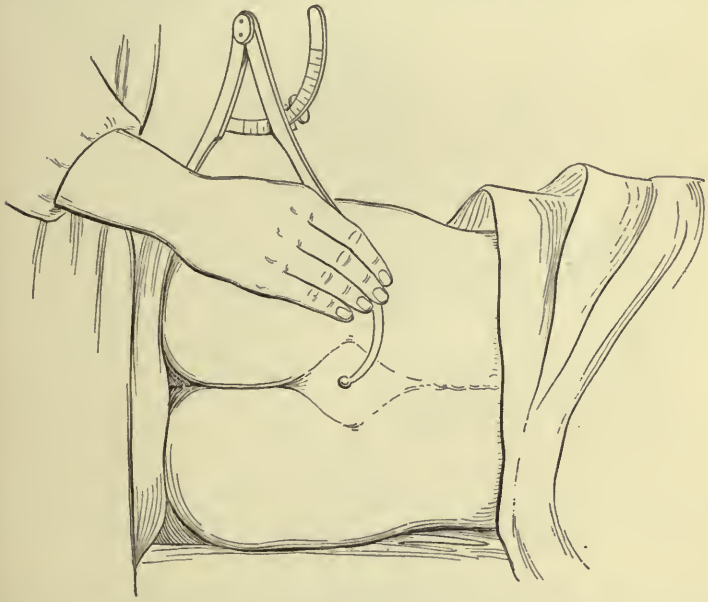

Fig. 30.—The external conjugate, antero-posterior diameter, by external pelvimetry.

hand which is to be inserted should be anointed with a lubricant. In primiparæ, but the first and second fingers can be inserted, and these should be passed directly backward in the vagina until the fingers reach the posterior wall of the pelvis. The elbows should then be dropped as low as possible, and the fingers passed upward with gentle but continuous pressure until the promontory of the sacrum can be felt. The upper border of the internal hand should then be

brought against the lower edge of the symphysis, and its position marked by the unemployed hand. When the hand is withdrawn the distance from the tip of the longest finger to the point marked on the edge of the hand should be measured. The fingers should again be inserted and the height of the symphysis measured as accurately as possible. From

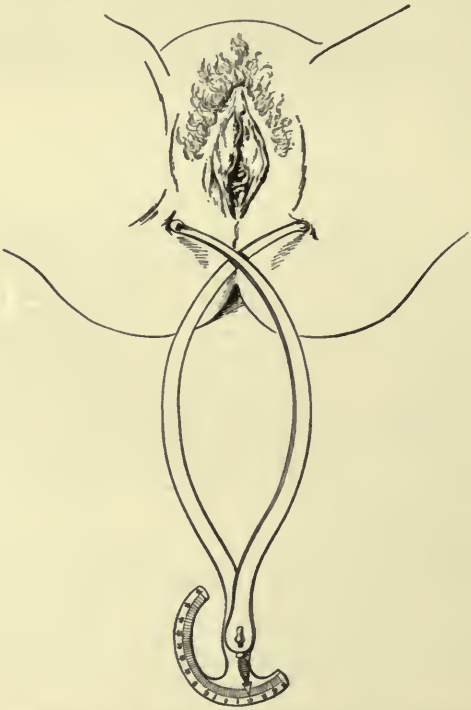

Fig. 31.—Measuring the transverse diameter of the pelvic outlet (Liepmann).

the longer measurement should be subtracted the height of the symphysis, which will give the internal antero-posterior diameter or conjugata vera. The measurement from the promontory of the sacrum to the lower border of the symphysis is normally 13 cm.; the height of the symphysis 2 cm., making the conjugata vera 11 cm.

To measure the antero-posterior diameter of the pelvic outlet the distance must be taken between the lower margin of the symphysis pubis to the tip of the coccyx. This may be measured with the hand or with an instrument, being 9.5 cm. and increased 2 cm. by the backward motion of the coccyx.

The advantage of using the hand for internal pelvimetry lies in the fact that the sensitive fingers appreciate irregularities in the contour of the pelvis. The pelvis should be palpated internally in all cases where abnormality is sus-

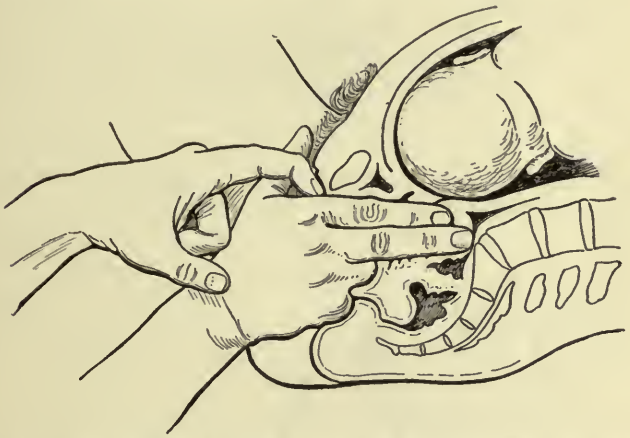

Fig. 32.—The internal conjugate, anteroposterior diameter, by vaginal examination (after Bumm).

pected. Instruments designed for internal pelvimetry are practically a long finger with a sliding scale.

Measuring the Comparative Size of Pelvis and Child.—This is the most important clinical measurement which can be made and should never be omitted. Upon this may depend an important decision regarding treatment.

If on palpation the head is found presenting and it is observed that the greater portion of the head is under the pelvic brim, and if the vaginal examination confirms the presence of engagement, the head is certainly proportionate in size to the pelvis. Normal uterine and muscular action will

bring the presenting part where the physician, if necessary, can deliver the child through the vagina.

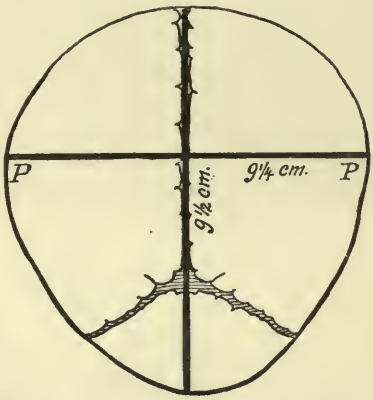

Fig. 33.—The fetal head, anteroposterior and biparietal diameters: *PP*, biparietal diameter (Faraboeuf and Varnier).

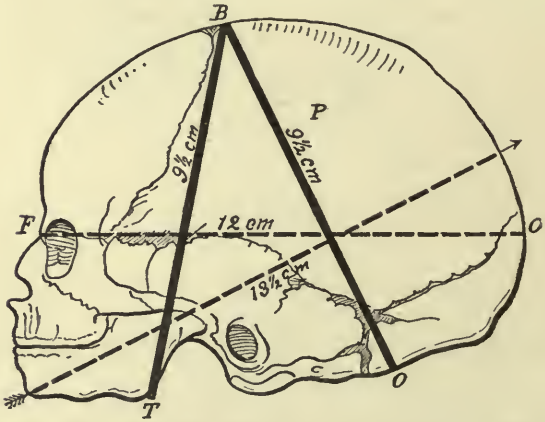

Fig. 34.—Measurements of fetal head in centimeters: *OF*, occipito-frontal diameter; *OB*, suboccipito-bregmatic; *BT*, trachelo-bregmatic. Maximum diameter indicated by long dotted lines (Faraboeuf and Varnier).

If on palpation the head is presenting but is not yet engaged, it is important to ascertain as nearly as possible

whether it can enter the pelvis. If the head is freely movable above the pelvic brim, it is sometimes called the floating head. For this the patient's urinary bladder must be completely emptied. She must lie upon her back with the legs and thighs flexed and supported, and her hips projecting slightly over the edge of a bed or table. While an assistant places his hand broadly across the fundus of the uterus the examiner introduces the longest fingers, or the whole of one hand within the vagina, carrying the finger-tips up to the pelvic brim. The other hand should then grasp the head with thumb and fingers, and while the assistant presses gently downward the examiner should carry the head gently but firmly downward and backward at the pelvic brim. The fingers of the internal hand should note whether the head enters the pelvic brim, or whether it cannot do so.

A frequent source of error in this examination lies in the fact that the head instead of entering, may dip one parietal bone into the pelvic cavity without actually engaging in the pelvic brim. This constitutes a parietal bone presentation, which is an impossible position of the head for labor and which indicates a serious abnormality.

In cases where pregnancy is prolonged or where there is abnormality in the mother's size, or disproportion, this procedure may be used to determine the induction of labor. It then becomes of especial importance, and if necessary anesthesia may be employed for a successful examination.

THE POSITION OF THE PLACENTA

Very rarely in thin patients with relaxed tissues the placenta can be felt by palpation. It sometimes alters the contour of the uterus, especially if it lodges in one cornu, so that its presence may be inferred by a projection in the wall of the uterus. Ordinarily the recognition of the placental bruit, already described, indicates the location of the placenta. It is especially important to recognize this bruit low at the pelvic brim in cases of placenta prævia.

GENERAL DATA OBTAINED BY EXAMINATION

By the examination of the pregnant patient just described, the examiner should form a fairly correct idea concerning the

development and vigor of the patient's abdominal and uterine muscle. He can also ascertain the development of the lower portion of the genital tract, and can usually recognize the primiparity or multiparity of the patient. The imminence of labor is evident where the examiner finds the presenting part low in the pelvis and the cervix soft and partially or completely dilated. If an unusually long, hard and resisting cervix, undilated, be present, with lack of development in the uterine and abdominal muscle, it will be evident that long and difficult labor may be anticipated.

THE DIFFERENTIAL DIAGNOSIS OF PREGNANCY

An essential in the diagnosis of pregnancy is the recognition of the living fetus by feeling its movements and hearing its heart sounds. As the fetus may be dead, it is necessary to differentiate pregnancy from other tumors and abnormal conditions whenever possible.

In ascites, with the patient lying upon her back, there is tympany on percussion over the centre of the abdomen, and dulness at the borders of the flanks. In pregnancy there is dulness over the centre of the abdomen and tympany of the border and flanks. With large fibroid tumors of the uterus the outline of the tumor is usually nodular and irregular. The uterus in pregnancy is smooth and regular in contour. Intermittent uterine contractions may alter its shape, but such contractions do not persist. A large symmetrical uterine fibroid which had undergone cystic degeneration in a patient might simulate very closely the shape, size, and consistence of the pregnant uterus. If the fetus were living its recognition would make clear the diagnosis, so a solid and cystic tumor of the ovary might resemble the pregnant uterus if no movements or heart sounds could be made out.

A dislocated spleen or kidney might descend as low as the pelvic brim, but such has not the consistence of the uterus and its contents, nor could the fetus be recognized. A large ovarian cyst might closely resemble the uterus distended from amniotic dropsy, and the abdomen has been opened and the uterus in this condition opened, under the belief that the

operator was about to remove an ovarian tumor. The irregular outline caused by multiple pregnancy is sometimes confusing especially if the amniotic liquid is in excess. The distended abdomen in pseudo-cyesis may resemble closely the contour of pregnancy, but on palpation no fetus can be made out, nor can heart sounds be heard on auscultation. The use of an anesthetic causes the phantom tumor to disappear.

Tubercular peritonitis and encysted fluid may closely resemble pregnancy, but here again no fetus can be recognized.

In some cases the diagnosis of pregnancy or its absence is so important that anesthesia should be used, if necessary, to complete the examination. No reliance can be placed in differential diagnosis upon the statements of a patient. Vaginal examination is of value, but softening of the cervix is sometimes present in conditions other than pregnancy. The recognition of the lower uterine segment in early pregnancy is the most important function of vaginal examination in these cases.

At ten weeks the uterus is as large as a good sized closed fist; at three months as large as a fist with a hand placed over it; at four months the fundus can be made out at the pubes; at five months the fundus is midway between the pubes and umbilicus; at six months the fundus is at the umbilicus; at seven months two fingers' breadth above it; at eight months a hand's breadth above; at nine months distending the tissues at the tip of the sternum; at ten months, in the primipara, it has descended into the pelvic brim; in the multipara the relaxed abdominal muscles permit the fundus to fall forward while the presenting part remains mobile above the pelvic brim.

THE DIAGNOSIS OF PREGNANCY BY OTHER MEANS THAN PHYSICAL EXAMINATION

Lately the effort has been made to diagnosticate pregnancy by studying the blood and the excretions of the mother. In the former Abderhalden's serum test for pregnancy has aroused much interest. If the embryo be considered a foreign body growing at the expense of the mother, and threaten-

ing her existence by the development of fetal tissue in the syncytium, the maternal organism will, if possible, protect itself against the invader. This it will do by producing ferments which can be recognized in the blood plasma.

Abderhalden discovered that during pregnancy albuminoid matter derived from the placenta is digested by the mother's blood ferments. The villi of the chorion are thus dealt with before the placenta is formed. These ferments are recognized as early as the first month and disappear usually within ten days after labor, at term, or abortion.

To recognize pregnancy, the placental tissue is subjected, in small quantities, to the digestive action of fresh blood serum from the patient in whom diagnosis is desired. This is done by dialysis in a suitable tube. The results can be recognized by color tests. The polariscope can also be employed.

It is evident that this method will be useful in cases where pregnancy is suspected, but evidence that the ovum is within the uterus is not forthcoming. It has been successful in many cases, but it has also been found that a similar result is obtained in non-pregnant patients the subject of diseases which profoundly alter the patient's metabolism. It should be employed in all doubtful cases, but should not be taken in the present stage of our knowledge as absolutely conclusive.

In early pregnancy there is the usual moderate anemia and leukocytosis, later giving place to plethora with a high percentage of fibrin and red cells.

The examination of the excretions of a patient to determine the existence of pregnancy is interesting, but often not conclusive. Blood serum from a pregnant patient injected into animals may produce disturbance or it may not.

If the pregnant patient be toxemic it may produce convulsions and death.

An effort has been made to diagnosticate pregnancy by recognizing abnormal bodies in the urine. Acetone, indican and other substances have been thought to indicate pregnancy. There are, however, so many conditions of disturbed metabolism in which these substances are present that their existence cannot be considered as positive proof of gestation.

The urine in pregnancy, however, always indicates in-

creased metabolism and excretion burdened to the limit. The percentage of urea is usually lessened, the rest nitrogen, creatin and creatinin and ammonia, are increased; hyaline casts are not uncommon, and a small quantity of serum albumin is often present. As gestation comes to its close milk-sugar is often detected and lactosuria may become pronounced. The specific gravity and the quantity of the urine vary greatly in different patients.

THE DIAGNOSIS OF PREGNANCY WITH THE DEATH OF THE EMBRYO OR FETUS

When the embryo dies and is retained, if it be within the uterus a slight discharge of dark-reddish fluid usually persists while the uterus remains slightly larger than normal; the changes in the breasts disappear, and disturbances in appetite and digestion cease, and the patient returns gradually to her normal condition. The blighted ovum is usually expelled after a varying time, and occasionally is completely absorbed. Should the syncytium grow excessively, syncytioma malignum may develop.

The death of the fetus in utero may be appreciated by the cessation of fetal movements, failure to hear fetal heart sounds, and the gradual absorption of the amniotic liquid, which causes the abdominal tumor to decrease in size. The patient may feel less disturbance in digestion for a few days, but if the fetus be retained long in the uterus a condition of toxemia is produced from absorption from the dead child.

If the ectopic fetus dies, its death is often followed by colicky abdominal pain, which gradually ceases. The mother's health may not be much disturbed, and if the fetus and its appendages do not become infected by bacteria from the adjacent bowel the fetus may undergo changes and remain indefinitely in the mother's abdomen. The amniotic liquid will be absorbed and the placenta may gradually become a thin fibrous mass. Such a fetus may undergo calcareous changes, becoming a lithopedion. When the dead fetus is retained in utero with unruptured membranes it becomes softened from the amniotic liquid, and the process known as maceration ensues.

Mothers are often alarmed by the apparent cessation of

fetal movements, when such is not really the case. A careful examination will often detect natural movement, and if the heart sounds are of average strength and vigor there is no occasion for anxiety.

THE DIAGNOSIS OF PREGNANCY BY THE X-RAY

When pregnancy is advanced so far that the fetal skeleton is well formed, the X-ray will give an outline of the fetus which may be available for diagnosis. The picture of the fetus will be successful in proportion as the head has not entered the pelvic cavity. If it be low down, the pelvic walls will obscure the outline of the fetal cranium. The position of the child in the pelvis, the presence of pelvic deformity, multiple pregnancy, and sometimes fetal deformity, may be outlined in this way. Accurate pelvimetry can be accomplished by using the normal pelvis as a standard of comparison, and utilizing its standard diameters for the measurement of the abnormal.

CHAPTER VIII

THE PHYSIOLOGY OF PREGNANCY

The most significant changes, aside from those occurring in the genital tract found in the pregnant woman, are those in the blood and in the organs of excretion and assimilation.

The Blood.—The weight of the body increases during pregnancy and at first the weight of the blood does not maintain its usual proportion. As pregnancy advances the red blood cells increase in number, while the hemoglobin at first is slightly diminished and afterwards increased. There is a notable gain in the quantity of fibrin, which coincides with a moderate leukocytosis. This is found more pronounced in multiparæ than in primiparæ, and where the fetus is a female rather than when a male child is born. If the patient be not well nourished during pregnancy the alkalinity of the blood increases.

The Heart and Pulse.—The shape of the heart changes somewhat as pregnancy advances, through the upward motion of the diaphragm. The walls of the ventricles are increased in thickness, and the muscle of the heart undergoes growth, which is comparable to that of the uterine muscle. Murmurs are heard not infrequently over the apex of the heart but cannot be connected with valvular disease. The action of the heart is increased in frequency, the tension of the pulse somewhat higher than in the non-pregnant, and the heart action and pulse are remarkable for their quick and frequent change in rapidity and tension. Any disturbance of the nervous system disturbs the heart and pulse tension at once.

The Respiratory Organs.—As the growing uterus and its contents press the diaphragm upward the capacity of the lungs is decreased. In pregnancy the patient breathes with the thorax only, the thorax expanding from side to side as

pregnancy advances. As the position of the heart is readily altered and pressure is brought to bear upon the diaphragm by motion, the respiration and heart action are alike very easily disturbed during pregnancy. The fact that the capacity of the lungs is decreased is illustrated by the frequent fainting which occurs among pregnant women when they are in a close or ill-ventilated room, and their almost constant craving for fresh air.

The Digestive Organs.—In early pregnancy the secretion of the salivary glands is very markedly increased, and in patients not in good condition may become so excessive as to be greatly annoying. In half of all pregnant patients there is some disturbance of the stomach in the early morning, usually terminating in brief vomiting. In one-third of pregnant patients, loss of appetite and dyspepsia develops as pregnancy advances. The material vomited is usually acid and often acrid mucus.

Constipation.—It is safe to say that no patient goes through pregnancy without constipation. While the bowels may move daily, the quantity of fecal matter discharged is insufficient, and feces accumulate and in extreme cases become dried and adherent to the wall of the intestine. Distention of gas occurs, in many patients complicating constipation. Where fecal matter decomposes and gas accumulates in great quantities, an examination of the pregnant abdomen may be greatly hindered by this condition.

Disorders of the appetite are very common in pregnancy and usually indicate some disturbance in the digestive organs. Patients frequently crave acids and acid fruits, while many cannot take articles of food which were formerly acceptable. The longing for acids is the natural result of a sluggish condition of the digestive organs when patients have disturbed metabolism. Some patients dislike meat and crave the lighter and more digestible articles of food and have a desire for at least the average or more than the average quantity of fluid. The appetite and craving of pregnant women for substances normally indicated during pregnancy must be considered an evidence of health. Abnormal cravings for indigestible and unusual articles of food should be taken as evidences of disease.

Secretion of Urine.—The quantity of urine excreted in 24 hours varies greatly in pregnant women. In ten patients studied by the writer the quantity varied from 40 to 80 fluid ounces. The average among these patients was 59.92 ounces, and the patients were under hospital observation, taking no medicine, and upon a mixed diet of digestible food. All were doing light work about the wards. The conditions were such that they represented a fair average. The quantity of urine should increase but slightly above the average, and should the converse be true the condition is not that of normal health. In many patients the coloring matter of the urine is greatly increased, and peptone and milk sugar are occasionally found. In many albumin is present during the early months of pregnancy, and in some a slight trace exists throughout the entire time. A considerable quantity of serum albumin is not normally present in the urine during pregnancy. Hyaline casts are occasionally present, with leukocytes and bladder epithelium, but large numbers of epithelial casts are never present in health. Small quantities of sugar may be present in the urine with increase of sulphates.

The nitrogen partition of urine in normal pregnancy shows a diminution of the quantity of urea, and an increase in the creatin and creatinin and rest nitrogen. The ammonia coefficient is often slightly increased. As pregnancy advances and the fetus becomes fully developed, especially as delivery approaches, the quantity of urea increases and the other nitrogenous constituents grow less in quantity. There is evidence that glycogen is stored up in the liver during pregnancy and that sugar is discharged in the urine in much less quantity, and much less frequently than in other cases with correspondingly equal metabolism.

The Discharge of Urine During Pregnancy.—The pressure of the growing uterus upon the bladder, especially when the patient is upright, makes frequent emptying of the bladder necessary in the pregnant woman. This disturbance is most pronounced in the early and the last months of pregnancy. The mucous membrane is congested, sensitive and irritable, and during the very last of pregnancy, in primiparæ, when descent develops, the neck of the bladder may be pressed

upon by the descending head and the urethra partially compressed between the head and the symphysis. So great may be the pressure in multiparous patients in whom the tissues are relaxed, that the involuntary discharge of urine is not infrequent. This may follow lifting a heavy weight, vomiting, coughing or sneezing. Should retention of urine occur during pregnancy it should lead to the suspicion that there is pressure upon the neck of the bladder, preventing the complete discharge of its contents.

Weight and Temperature.—Aside from the increased weight of the fetus the healthy mother becomes heavier as pregnancy advances. This is probably caused by the actual increase in the maternal tissues following the stimulation to nutrition occasioned by pregnancy. In healthy patients the temperature of the body is correspondingly raised.

The Skin.—The skin and its appendages are considerably altered during gestation. In proportion to the patient's complexion, pigmentation in the skin may become very pronounced. When this forms upon the face in an irregular mask, usually a yellowish-brown, it is termed the chloasma of pregnancy. No treatment has proved efficient in preventing or modifying this appearance, and it disappears when pregnancy ends. Pigmentation about the breasts, on the abdomen, and about the external genital organs, is often observed. The skin often acts freely in pregnant women, and an acid and irritating perspiration may disturb the patient's comfort. In women who have any tendency to gout the hair may come out in considerable quantities during pregnancy. In patients who are in good condition, the hair is but little if at all affected, and often improves considerably during gestation.

Few pregnant patients escape trouble with the teeth. There is softening and exposure of the nerve to irritants, with resulting pain, which may greatly distress and disturb the patient. The teeth should be examined in early pregnancy, and again from time to time as gestation advances. No severely painful dental operations should be practised upon pregnant women, but palliative measures are indicated until pregnancy is over.

The Skeleton.—The entire skeleton increases considerably during gestation, and in healthy patients never returns to its former dimensions. Bones grow normally by the increased deposit of tissue at the epiphyses. In patients who have been slender and poorly developed, pregnancy may result in a very considerable increase in the capacity of the pelvis and of the thorax as well.

The Nervous System.—Increased reflex excitability is characteristic of pregnancy. This is seen in disturbance of the pulse, fainting and giddiness, change in facial color, in the action of the heart and the pulse, susceptibility to cold and heat, and disturbance in the condition of the mind. The latter may not be severe enough to constitute actual disease, yet it renders the patient unduly sensitive to mental impressions. Under favorable conditions the patient may be unusually buoyant and even exhilarated.

Sleep may be disturbed in later pregnancy by the movement of the fetus, and at times by the patient's condition of apprehension and even melancholy. The more sound and vigorous the patient the less is her natural disposition altered.

Neuralgia.—Many pregnant women in good average health suffer considerably from neuralgia. This may follow the altered state of the blood in early gestation, and in later pregnancy pressure of the presenting part upon nerve trunks passing the pelvis may favor this condition. As pregnancy grows to a close the pressure of the presenting part may cause pain in the pelvic nerves, sometimes extending downward upon the thighs.

In general, healthful pregnancy means stimulation to all the normal processes of the body, with increased nutrition and correspondingly increased demands upon the processes of assimilation and excretion.

CHAPTER IX

THE HYGIENE OF PREGNANCY

By the hygiene of pregnancy is meant such care as should be given every pregnant woman independently of the development of diseased conditions.

THE EARLY MONTHS

During early pregnancy patients in good general condition may experience marked disinclination to exertion, with a desire for rest and quiet. When one remembers that at this time the fetal tissues are growing most rapidly and that the mother's organism is resisting excessive fetal growth, and that her strength is necessary for this process, the apathetic state of early pregnancy becomes intelligible. Patients are often urged to exert themselves in early pregnancy, and a far more rational course would be to give them abundant rest and quiet, with plenty of easily digested nourishment. When it is found that the patient is not hysterical or lazy, her craving for rest should be considered natural and should be gratified. The disturbance of the digestive organs suggests that large quantities of food, difficult of digestion, should be avoided, and that the patient should often be given the lightest and most digestible sorts of food. Those who can take milk should have this frequently in any form which is acceptable. The craving for fruit should be gratified, and good bread and butter should be added to the diet. Broths, soups, green vegetables, simple puddings, junket, and toast, will be found useful. Many patients crave food frequently, but in small quantities, and this craving should be gratified.

The patient's hesitation in going into crowds or where she will be observed, should also be considered a rational condition, and she should be spared all annoyance and possible distress.

In early pregnancy, constipation is often present, so that especial attention should be given to this. Compound licorice powder, cascara, phenolphthalein, senna or senna leaves, laxative cereal foods, raw or cooked fruit, cream, and olive oil, may all be employed. to prevent constipation. An abundant supply of cool pure water is essential. Should these means fail, enemata may be used for a short time, those containing warm soap-suds and olive oil being especially useful.

During the early months it is especially important that the patient adjust her clothing suitably. The uterus cannot rise naturally out of the pelvis unless pressure be removed from the abdomen. If corsets must be worn they should be loose, the patient should be cautioned to empty the bladder frequently, and constipation must be avoided. It is well to substitute for the corsets a suitable waist, to whose lower edge the underclothing can be attached. Constriction of the pelvic and abdominal regions should be entirely avoided. The clothing should be sufficient to protect the patient from chill, and as light as is consistent with comfort.

At this time the patient is often exceedingly susceptible to cold and damp. Exposure must be avoided, and in time of intense heat every precaution must be taken to avoid sunstroke or heat-stroke.

It is especially important in the early months to avoid the interruption of pregnancy, which constitutes abortion. Any disturbance of whatever sort of the pelvic organs is to be absolutely prohibited, such as lifting, straining, reaching high above the head, running a sewing machine with a foot treadle, high steps, violent exercise, travelling in an uncomfortable vehicle, motoring at high speed over a rough road, and any situation exposing the patient to jar or strain is to be prevented. At the times when menstruation should have returned, especial care must be taken, and if there be signs of disturbance the patient should remain recumbent at this period. An examination of her urine should frequently be made, not less often than weekly in primiparous patients, and such examination should be complete. Written instructions concerning diet, the care of the digestive

organs, and other important matters, should be furnished. The physician must see his patient often enough to be sure of her condition.

THE LATER MONTHS

If the early months have passed successfully, the later months, especially the fifth, sixth, seventh and eighth months, call for moderate exercise and a much more active life. Gentle exercise in the open air to the point of reasonable fatigue is of great value. Any reasonable exercise may be taken and walking is the best possible form. Those entertainments and surroundings which are cheerful and not perturbing are of great use, and the atmosphere of the patient's life should be as exhilarating as possible. Abundant sleep in the best possible air is necessary. The clothing should be so arranged as to avoid constriction, not only of the abdomen but of the lower limbs as well, to prevent the development of varicose veins. The clothing should be so arranged as to permit the freest possible motion. In vigorous women the appetite often increases very largely, and this may be gratified, but with great caution, to avoid the excessive use of meat. Experience has shown that the fetal skeleton becomes unusually large and heavy in the children of women who eat meat in excess, while a diet composed largely of milk, bread, fruit and vegetables, favors the growth and nutrition of the child but does not produce excessive development of the bones.

To secure a spontaneous and successful birth the regulation of the mother's diet will be found of importance.

As pregnancy advances the increased demand upon elimination calls for additional care in the matter of diet. The urine should be examined regularly, the pulse tension of the patient observed, and the patient should be instructed in writing to report at once to her physician, headache, disturbance of vision, constipation, loss of appetite, swelling of the limbs or face, and unusual movements of the fetus. The reappearance of menstruation or hemorrhage from the genital tract must be brought immediately to the physician's attention.

THE LAST WEEKS OF PREGNANCY

The patient should be told concerning the phenomena of the last weeks of pregnancy so that she may observe and report the descent of the fetus, increased pressure upon the bladder or bowel, swelling of the limbs, and increased or lessened movement of the fetus. Unless she has with her a friend, nurse, or experienced person, she should be instructed in the character of labor pains, so that she may recognize those which are genuine and summon help in time, and not be mistaken concerning those pains which are not the beginning of labor.

THE GENERAL HYGIENE OF PREGNANCY

Too often pregnancy comes unwelcome to the patient who is fully occupied with other matters. In such cases she endeavors to pursue her usual occupations, giving to the growing fetus such strength or energy as may be left. It is obvious that in these cases one cannot expect the best possible development in the child under the conditions present.

Where the patient accepts pregnancy gladly and is willing to order her life accordingly, a corresponding development and vigor will be found in the child. It has long been believed that pregnant patients should avoid everything which is disturbing. The ancients believed that by surrounding the patient with beautiful objects the development and symmetry of the child was greatly enhanced. Unquestionably the mental condition of the mother has an important bearing upon the development of the nervous system of the infant. Such precautions are usually followed with a corresponding beneficial result.

THE END OF PREGNANCY

To compute the probable time of confinement, it is first necessary to accurately obtain the date of the end of the last normal menstruation. In questioning the patient, care should be taken to emphasize the word, normal or natural, in speaking of menstruation. A period considerably less than the average indicates that conception has occurred just before menstruation; 270 days from the date of the last men-

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struation will give the patient the probable average time of confinement in the first two or three of her pregnancies. After this, between 270 and 280 days should be obtained by actual count from the end of the last menstruation.

The descent and engagement of the child in primiparous patients indicate that pregnancy is very near its close. If more accurate information is desired a vaginal examination to determine the condition of the cervix and the presence or absence of descent of the fetus, will be found useful. Physical examination at the end of pregnancy is more reliable than the computation of days.

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CHAPTER X

THE MATERNAL AND FETAL PATHOLOGY OF PREGNANCY

Pregnancy brings about such great changes in the mother's organism that but very slight variations suffice to produce pathological conditions. Of these the most common and one of the most important is the *toxemia of pregnancy.*

THE TOXEMIA OF PREGNANCY

It has long been known that a warm-blooded animal may destroy its own life through the absorption of poisons produced by the waste of its own tissue. Death from starvation is an example of this, and in acute conditions sunstroke and heatstroke illustrate its pathology.

In the pregnant woman the presence of the embryo and fetus gives rise to substances poisonous to the mother, in addition to those formed in her own tissues.

While numerous theories have been advanced to account for the toxemia of early pregnancy, it seems most rational to ascribe it to the absorption of substances formed by the embryo and fetus in addition to those produced by the waste of the mother's body itself. These poisons, whether fetal or maternal, are called toxins, and the condition produced by their absorption is known as toxemia.

Signs and Symptoms.—The important signs and symptoms of the toxemia of early pregnancy are those indicated by disturbances in digestion and assimilation, an altered state of the blood, and as a result the nausea and vomiting of the early morning becoming exaggerated, the sensation of nausea persisting throughout the patient's waking hours. Accompanying this is great prostration, loss of appetite, a heavy lethargic sleep later giving place to unpleasant dreams and restlessness, the failure to retain anything upon the

stomach, obstinate constipation, and substernal pain extending from the epigastrium. The pulse is rapid and grows progressively weak, respiration is sluggish, and as the disease progresses the matter ejected from the bowel contains an abundance of disintegrated blood cells which resemble coffee-grounds. Similar material is discharged from the bowel. The urine is diminished greatly in quantity, with high specific gravity, frequently albuminous, and often contains epithelial or granular casts. The nitrogen partition shows greatly lessened urea with corresponding increase in creatin and creatinin, the rest nitrogen is increased, and indican is present. Casts of various sorts are often found. As the disease progresses the patient in some cases becomes greatly emaciated, in others there is considerable deposit of fat, the action of the heart is progressively rapid and weak, frequently becoming thready and irregular. The mouth and gums become covered with sordes, the odor about the patient is offensive, and the skin is in places the site of a purpuric or hemorrhagic condition. The patient's general condition resembles that of the third or fourth week of a severe typhoid. In fatal cases life usually terminates in exhaustion without convulsions or delirium.

In cases which do not go to a fatal termination the symptoms gradually subside, the patient is able to take and assimilate food, and her general strength returns.

The Diagnosis of Pernicious Nausea and Vomiting.—In making this diagnosis the physician must remember that two classes of patients are especially apt to mislead: One is those who are hysterical, in whom the nausea and vomiting are entirely neurotic, and in whom the condition, while apparently serious, is not really dangerous.

Another class of cases is those which mislead, and encourage nausea and vomiting in early pregnancy, exaggerating the symptoms with the hope that the physician may be induced to perform therapeutic abortion.

To distinguish between patients who are really in a serious condition and those who are nervously disturbed, a careful physical examination of the patient is necessary. The action of the heart and the condition of the pulse in those really ill give a favorable indication. The action and

sounds of the heart are duller and weaker than normal, the pulse is small, feeble, irregular and often very rapid. The general condition is one of extreme apathy, and this is present when the patient is left entirely alone or when she realizes that no one is observing her. Efforts to rouse her by mental stimulation fail, and it becomes evident that the patient is really self-poisoned. This is confirmed by the examination of the urine, and of especial importance is the examination of the blood. Such will show in the urine a greatly lessened urea percentage and high ammonia coefficient, with increase in other nitrogenous bodies. Examination of the blood finds the red cells much altered and broken down, with blood coloring matter free in irregular masses.

Microscopically the urine may contain a considerable number of epithelial or granular casts. The total quantity of urine is greatly diminished. There is progressive loss of weight, and almost or entirely complete inability to retain and assimilate nourishment. There is great tenderness over the epigastrium, and a burning and constant pain beneath the sternum. The mental state of the patient is apathetic.

In contrast the nervous patient is often cured by suggestion,—by ascertaining what would be most agreeable and desirable for her, and by proposing such a change in her environment or surroundings. A very simple remedy, such as a hypodermatic injection of water, may produce good results. Removing the patient from irritating or depressing surroundings has often resulted in rapid cure; putting the patient at rest, and giving proper feeding frequently causes the symptoms to disappear.

In patients who are endeavoring to deceive the physician, an opinion as to the severity of the case must not be given until there has been abundant opportunity to examine the blood, the urine, and to give the patient a complete physical investigation. While the patient's statements need not be openly rejected, no reliance should be placed upon them.

The Differential Diagnosis.—Pregnancy must first be demonstrated. If care is not taken to establish this fact grave errors may result. Patients have been treated for gastritis and gastric ulcer, for hemorrhage from the kidneys, for tumor of the brain, for nephritis, and for malignant dis-

ease of the uterus, when the condition really causing the symptoms was the toxemia of pregnancy.

Pregnancy established, we must next distinguish between hysterical nausea and vomiting and acute toxemia.

In hysterical nausea and vomiting the patient's heart action and pulse, while easily disturbed, remain good. When the nervous system is freed from depressing influences, and when the mind is soothed and stimulated the patient grows better.

To make a complete diagnosis the patient must be put under intelligent observation, the condition of the digestive organs looked after, and the patient supplied with easily digested food. The urine will be found slightly altered, if at all, the nitrogen partition of the urine will show a reasonably high percentage of urea, while the ammonia, rest and creatinin nitrogen will be low. The examination of the blood will show moderate leukocytosis and no disintegration among the red cells. The urine will not contain epithelial blood or fat casts, and the matter ejected from the stomach and the bowel movements will not contain disintegrated blood.

In acute toxemia in the early months the patient's nausea will be constant and will become pernicious. Food cannot be retained, the quantity of urine will be scanty, the urea nitrogen low and the ammonia, rest and creatinin nitrogen high. There will be epithelial, blood or fat casts; the blood will show increased leukocytosis, and Abderhalden's serum test of pregnancy will give increased evidence of disturbed nitrogenous metabolism. As the case becomes severe the red blood cells will be found disintegrated and crystals of hematin will be present in considerable quantities.

The patient's mental condition will be apathetic, sordes will form upon the mouth and teeth, the abdomen will become scaphoid, emaciation will occur; or the patient may remain plump but fat and flabby. There will be substernal pain, and there may be considerable hemorrhage from the stomach, bowels and the mucous membrane of the mouth, or beneath the skin. Death will ensue from disintegration of the heart muscle or cerebral hemorrhage.

When acute toxemia with pernicious nausea is caused

by the overgrowth of syncytium the symptoms may be difficult to interpret. Upon the clinical picture of pernicious nausea will be grafted evidences of malignant growth in the important viscera. If the brain and its membranes be involved there will be obstinate pain and sometimes active delirium. If the lungs are the site of metastases there will be altered respiration, pulmonary cough and perhaps expectoration. If the abdominal viscera be attacked the liver will slowly enlarge and there will be evidences of acute malignant toxemia.

The differential diagnosis of acute toxemia in early pregnancy with pernicious nausea is important, because in genuine and severe cases pregnancy must be promptly terminated. The responsibility for performing therapeutic abortion is great, and the decision to take this important step requires accurate knowledge and good judgment, and may also render necessary consultation.

Pathology.—In acute toxemia in early pregnancy the most characteristic pathological changes will be found in the blood and in the viscera connected with metabolism. In the blood disintegration of blood cells, the presence of free hematin, leukocytosis, and a highly poisoned condition of the blood serum, demonstrable by injection into animals, will be present. In the viscera connected with metabolism the mucous membrane of the stomach and intestine will show degenerate changes and multiple hemorrhage. In the liver interstitial hemorrhage into the lobules is characteristic. The small vessels are plugged with hematin and the liver substance is stained. Similar appearances in the spleen in less degree are also seen. In the kidneys the epithelia undergo granular and fatty changes, the capillaries rupture, and free hematin is present. The thyroids and suprarenals may show a similar change. Hemorrhagic pancreatitis may be present.

The bone marrow shows degenerative changes, the subcutaneous fat disappears or becomes brightly stained with bilirubin or biliverdin, the periosteum upon the inferior surface of the sternum may be swollen and dark, and the connective tissue beneath the sternum engorged and altered. The capillaries of the lungs undergo minute rupture, the pleuræ are altered, and turbid straw-colored fluid may be

found in the pleural sacs. In the brain a condition similar to that observed in the lungs and their serous membranes may be present. In hemorrhagic cases considerable areas of necrosis may be observed in the mucous membrane of the stomach and bowels and in the kidneys, and rarely in the bladder. When petechial eruptions are present the small vessels of the skin rupture, the muscular tissues become wasted or degenerated, the muscles showing cloudy and granular conditions; nerve cells exhibit granular changes and the neurilemma may give evidence of degeneration. In albuminuric cases hemorrhages into the retinæ are not infrequent. In some patients the veins of the esophagus may be considerably distended and their rupture may cause hemorrhage.

Prognosis.—In pseudo-hysterical nausea and vomiting in early pregnancy, the prognosis, so far as recovery is concerned, is good. Such cases are sometimes difficult to manage, as some of them are illegitimately pregnant and the condition must, if possible, be concealed.

In genuine acute toxemia of early pregnancy with pernicious nausea the prognosis is always guarded. Unless complete control of the patient can be obtained, and elimination and nutrition promptly stimulated, the patient may rapidly pass into a condition where pregnancy must be interrupted. Neglected cases of acute toxemia in pregnancy frequently die.

Treatment.—The treatment of hysterical nausea and vomiting of early pregnancy simulating toxemia consists in rest, stimulation of the eliminative organs, systematic and careful feeding, and mental treatment by suggestion. The improvement is usually rapid, when the patient should be advised to take up her normal life as quickly as her strength will permit, being careful to avoid excitement and over-fatigue. Especial attention should be paid to nutrition and excretion until pregnancy is well established and the placenta has fully formed.

In acute toxemia with pernicious nausea, the mistake is often made of attempting to treat the patient without complete control. Unless the patient be under constant and accurate observation she may rapidly drift into a hopeless condition before the physician realizes the gravity of the situation.

Such patients require isolation and trained nursing. The action of the heart should be steadied and stimulated by strychnia and digitalin given hypodermatically. If there is much nervous excitement or restlessness, to this should be added codein in appropriate doses.

If foul material has been ejected from the stomach, copious gastric lavage is indicated. This should preferably be with a warm saturated solution of bicarbonate of sodium using fluid in abundance until the return flow is perfectly clear; eight ounces to one pint should then be left in the stomach for absorption. Once in twenty-four hours the colon should be thoroughly flushed with normal salt solution, no limit being placed upon the amount employed. The fluid should return clear and a pint should then be left in the bowel for absorption. If the action of the heart is reasonably good, and the heart muscle is able to deal with increased fluid, eight ounces of salt solution should be given by bowel every four to six hours. Where the presence of the catheter is well tolerated, salt solution may be given by the continuous method for two-hour periods.

Every effort must be made to sustain the patient or to reinforce the condition of the blood. For several days, at first, the patient must be nourished and sustained by nutrient enemata containing peptonized milk, panopeptone, raw eggs beaten up, and brandy or whiskey. This requires very skilful and conscientious nursing, and care must be taken to so adjust the injection of salt solution and rectal feeding that the bowel does not become irritable, and reject what is given. To maintain the patient's body heat, the skin should be cleansed with warm soap and water and the patient placed between blankets. In hot weather, alcohol and water sponging should be used. An abundant supply of oxygen by open windows or by direct inhalation is useful.

The patient must be put at absolute rest and disturbed as little as possible. It is well to avoid hypodermoclysis because of the tendency to subcutaneous extravasation and hemorrhage. Benefit has been occasionally seen by lowering the patient's head and raising the remainder of the body considerably. A hot water bottle covered with flannel placed beneath the cerebellum may prove stimulating. A hot water

bottle or dry ice-bag placed over the epigastrium may relieve some of the patient's painful sensations.

If the patient grows better a cautious effort may be made to give nourishment by the mouth. Peptonized milk, orange, grape fruit, lemon, or pine-apple albumen, beef juice, gruels and whiskey or brandy, may be tried. These patients often crave nourishment persistently, and such must be given every hour or two in small quantities. Whatever drugs are used should be given by hypodermatic injection, and the functions of the stomach utilized for nourishment only.

The Interruption of Pregnancy.—If upon thorough and conscientious care improvement does not occur, and the examination of the blood and urine and physical examination of the heart shows no gain, but slight loss, pregnancy must be interrupted.

For this purpose ether, largely diluted with oxygen or carbondioxid, should be employed. The patient should be disturbed as little as possible and elaborate preparation of the patient is unnecessary. Copious gentle irrigation with one per cent. lysol is sufficient.

The cervix should be drawn down and dilated with solid dilators until a large blunt spoon curette can be introduced. This should then be passed over the surface of the uterus, and if possible the ovum be thoroughly broken up. The uterus should then be packed tightly with sterile or 10 per cent. iodoform gauze and the vagina moderately tamponed with sterile gauze. The whole procedure should be done as gently and quickly as possible, no effort being made to curette away the ovum. Nausea usually ceases at once, and on the removal of the gauze in forty-eight to seventy-two hours, the ovum is found adherent to it, or soon afterward expelled.

Treatment by Counter-irritation of the Cervix.—In some cases of hysterical vomiting of pregnancy immediate control of the case has been obtained by painting the cervix with iodine or by moderately dilating the cervix. In these cases an irritable condition of the cervical mucous membrane, or a tightly contracted os, which did not soften naturally, has been the irritating cause which kept up the nervous disturbance. In acute toxemia such procedures are useless.

Complications.—In acute toxemia of early pregnancy, although the ovum may have been expelled, fatal hemorrhage may occur at any time within two weeks following the termination of pregnancy. An effort should be made to control such bleeding by tamponing the uterus again, and by tightly packing the vagina. This effort is rarely successful, and secondary hemorrhage in these cases is usually fatal.

The Effect Upon the Ovum of the Acute Toxemia of Early Pregnancy.—In hysterical nausea and vomiting of early pregnancy the growth and development of the embryo are influenced surprisingly little. The patient usually goes to full term and the fetus will show no result of the mother's condition except an inherited instability of the nervous system.

In acute toxemia, independently of the interruption of pregnancy, hemorrhage frequently occurs into the ovum from the decidua and into the chorion. Such apoplexies may destroy the life of the embryo and blight the ovum. Such may be retained in the uterus for several weeks and finally expelled. The patient's symptoms often grow markedly better with the death of the embryo, so that sudden spontaneous improvement may be taken as a sign of embryonal death. Retention of such an ovum is dangerous because its syncytium may grow luxuriously and produce syncytioma malignum.

THE TOXEMIA OF LATER PREGNANCY

After the formation of the placenta toxemia does not so often produce pernicious nausea, but may cause the other conditions described, culminating in acute fulminant toxemia, sometimes called eclampsia without convulsions or eclamptic seizures. In these cases the blood becomes excessively poisonous, the blood serum rapidly destroying animals into which it is injected. Disintegration of the blood ensues. The walls and the vessels of the endocardium and heart muscle undergo acute degenerative changes; the liver and other organs of assimilation show parenchymatous hemorrhage; in the brain hyperemia or acute anemia with multiple hemorrhage, edema of the ventricles and acute degeneration of nerve cells, are observed. Should pregnancy

terminate the patient may succumb from multiple pulmonary hemorrhage with minute areas of gangrene, the decidua becomes extensively degenerated, and the normally implanted placenta may separate in varying extent, causing hemorrhage which may be concealed or apparent. Degenerative changes in the epithelia of the kidneys with hemorrhage, may greatly impair their function, lessen the quantity of urine, and produce serum albumen in excess, with casts in the urine.

In fulminant toxemia the patient is seized with intense epigastric pain, with violent vomiting, or very severe nausea and syncope; the circulation is greatly depressed, there may be hemorrhages from the stomach, bowel, or from the uterus, following placental separation. Death may ensue without convulsions from rapid granular degeneration of the heart muscle or from cerebral hemorrhage.

When the resisting power of the patient is greater, Nature may endeavor to save her life by producing convulsions. Such are epileptiform, clonic, tonic, and are often accompanied by active uterine contractions which terminate pregnancy. Should labor fail, convulsions may hasten the patient's death by overburdening the heart, paralyzing the respiratory centre and causing acute cerebral edema or hemorrhage. Should toxemia persist after the uterus is emptied, pulmonary hemorrhage and gangrene must be feared.

Diagnosis.—The diagnosis of the toxemia of later pregnancy is less often marked by nervous symptoms than in the earlier months. The mind is usually disturbed and the patient is melancholic, apathetic or sleepless and intensely irritable. In proportion to the resisting power of the patient the pulse tension is greatly increased or much lowered. A moderately high pulse tension is a more favorable sign. The secretions are noticeably diminished in quantity and altered in quality. The secretory nerves are paretic or paralyzed; the skin may be dry or greatly relaxed, with clammy perspiration; the tongue is usually furred and coated, often flabby, sometimes resembling the tongue of a typhoid patient. In moderate degree jaundice may be present.

The fetal movements are sometimes unusually active, the fetal heart sounds more rapid and often more weak than normal. If convulsions occur they are epileptiform in

character and tend to increase in violence and frequency as the case progresses. They sometimes cease when the uterus is empty, but such is not inevitably the rule.

On examining the urine the quantity is lessened, its specific gravity usually increased, and occasionally diminished. The urine is but little if at all poisonous on injection into animals. If the kidneys are greatly over-burdened, serum albumin will be found in excess and kidney débris of various sorts may be present. The nitrogenous content of the urine will be altered in proportion to the involvement of the liver.

In toxemia of hepatic origin the urea will be greatly lessened and the ammonia, rest and creatinin nitrogen increased. Bile coloring matter and hematin will also be found.

The examination of the blood will show a moderate leukocytosis with greater or less disintegration of the red blood cells. If fecal matter can be obtained for examination it is usually dark in color, often dried and exceedingly foul in color. If the fluid which is expelled in hemorrhage is examined it is dark in color, clots feebly in dark current jelly masses, and is found to contain an abundance of hematin.

The mammary glands are often turgid, without secretion, or yielding a thin and watery fluid or a thick and intensely yellow material.

Prognosis.—The prognosis of toxemia in the later months of pregnancy must be exceedingly guarded. In young patients with good heart action, where the cervix is soft, the fetus low in the pelvis, in normal position, and where labor gradually develops, the prognosis is fairly good. In older patients with resisting cervix, feeble heart action with relaxed and flabby tissues, the prognosis is far from encouraging.

Treatment.—No subject has occasioned greater discussion and in nothing is there a wider difference of opinion. The observation that the termination of pregnancy is often followed by the cessation of convulsions, and the fact that many of these cases are unrecognized until convulsions occur, have led to the belief that immediate delivery is imperative. When one considers that immediate delivery does not cure all cases, that convulsions are a conservative effort on the part of Nature to cause elimination and often bring about

spontaneous labor, and when it is observed that a patient at full term may pass through acute toxemia with convulsions without labor and subsequently give birth to a living child, it must be admitted that the decision to immediately deliver all cases is illogical and unwise.

The majority of observers at present believe that the first and important step in the toxemia of the later months of pregnancy lies in prophylaxis. A child-bearing woman must be instructed in the hygiene of pregnancy, pregnant women must be under personal observation by physicians, the hygiene of pregnancy must be strictly enforced and abundant opportunity given for the physical examination of the patient and the examination of the blood and urine. Could these measures be carried out, the toxemia of later pregnancy would rarely become dangerous. When, however, through neglect or otherwise, toxemia becomes acute, the most active measures must be taken to secure prompt elimination. If the patient be stuporous, with high pulse tension, whether convulsions have or have not occurred, the most efficient treatment consists in taking from a vein from 8 to 20 ounces of blood, followed by the injection of from 16 to 32 ounces of warm normal salt solution. Following this the stomach should be very thoroughly irrigated with saturated solution of bicarbonate of sodium or normal salt solution, and from 2½ to 5 grains of calomel with soda left in the stomach. The colon should be copiously irrigated with warm salt solution and from a pint to a quart left for absorption. The bladder must be emptied by catheter and the urine saved for examination. Especial attention must be paid to the condition of the heart, and digitalin with or without codein should be given hypodermatically. The patient must be put at absolute rest, the skin cleansed with warm soap and water, and the patient covered with blankets, except in the hottest weather. Should the skin be relaxed and clammy, and the weather excessively hot, sponging with alcohol and water will be useful. Especial care must be taken to protect the patient from all noise and irritation. She should be secluded in a well ventilated room and kept, so far as possible, at absolute rest. Should convulsions occur, if excessively severe, they may be controlled by the inhalation of oxygen or a

small quantity of ether well diluted with oxygen; chloroform should not be used.

So soon as eliminative treatment has been practised, a vaginal examination must be made to determine the condition of the generative tract. If the cervix be completely softened or obliterated, if the presenting part be low and dilatation beginning and partly accomplished, the membranes should be ruptured. This will be followed by a period of quiescence and then by uterine contractions, which may cause convulsions. If the fetus is not expelled spontaneously in a reasonable time, delivery should be effected by the forceps or version. Moderate hemorrhage from the uterus may be permitted after delivery. Realizing the possibility of serious post-partum hemorrhage the uterus and vagina should be tamponed with gauze.

If the cervix be undilated and in primiparous patients not softened, in multiparous patients non-elastic through the presence of scar tissue, the membranes should not be ruptured. Eliminative treatment should be pushed by repeated intestinal irrigation, the inhalation of oxygen employed and the circulation and the nervous system sustained and controlled by digitalin and codein hypodermatically. Small doses of strychnia may be used if necessary. If improvement does not follow and uterine contractions irritate the patient and encourage convulsions, the patient should be promptly delivered by Cesarean section, abdominal or vaginal. The choice of operation will depend upon the experience and individual preference of the operator and the condition of the genital tract. If extensive incision should be required and the lower uterine segment is excessively distended or is badly developed, abdominal section is unquestionably safer. Before viability, vaginal section; after viability, abdominal section are indicated.

The Treatment After Delivery.—No greater mistake can be made than to imagine that the patient is safe and requiring no attention, because delivery has been effected. The same treatment which was carried out before delivery should be continued, varying the intervals for treatment, and the dosage of digitalin, codein and strychnia, in accordance with the conditions which develop. So long as the patient's

general condition remains good, convulsions of moderate severity do not necessarily indicate a fatal issue. If the patient be highly excitable and restless, the use of a detention sheet will greatly assist in controlling her. If improvement occurs she will become partly or wholly conscious, will be able to swallow liquids, the secretion of urine will increase, the heart action grow better, and the nervous disturbance gradually subside.

Unusual Methods of Treatment.—Edebohls advised and practised in the toxemia of later pregnancy the decapsulation of the kidneys. This is effected by exposing the kidney through the usual lumbar incision, incising its convex border, and stripping back and freely loosening its capsule. In some cases this is followed by almost immediate increase in the quantity of urine secreted, with improvement in the patient's general condition.

Sellheim has practised amputation of one or both breasts in the acute toxemia of pregnancy, usually with convulsions. In some desperate cases which resisted all other treatment, this has been successful. The operation is based upon the fact that in cows a condition similar to acute toxemia develops, which is promptly relieved by injecting air through the teats into the udder. In these cases milk has not been secreted normally and the alteration in the tension of the udder following the injection of air or sterile water usually produces the secretion of milk with the subsidence of symptoms.

The Specific Treatment of Toxemia.—In some cases with sufficient pulse tension and sluggish metabolism the administration of thyroid extract benefits toxemic patients. In these cases hypo-thyroidism has been present. Goitre of moderate development is often observed among these patients. In cases of hyper-thyroidism with enlarged and active thyroid, the injection of thyroid extract is contraindicated and may be followed by intense palpitation of the heart and great dyspnea.

FETAL TOXEMIA IN LATER PREGNANCY

The fetus shares in the pathology and the dangers of the mother in the toxemia of later pregnancy. Toxins pass from mother to child, and from child to mother through the me-

dium of the placenta. As this important organ becomes overburdened, hemorrhage occurs in its substance, which obliterates considerable areas, destroying their oxygenating function. In albuminuric cases infarct occurs in varying degree. The fact that the fetus undergoes a similar process with the mother should be remembered in the treatment of the mother. It would be obviously unfair to subject her to greatly increased risk to save the life of the fetus born diseased. During acute toxemia the fetus may die in the uterus from asphyxia or visceral changes. This is often followed by an improvement in the mother's condition and by the subsequent expulsion of the dead fetus.

Should the mother die in acute toxemia and fetal heart sounds be heard, the child being viable, it is the duty of any physician present to immediately extract the child from the body of the mother by post-mortem section. If the mother's toxemia has been of brief duration the life of the child may be saved. In many cases the child subsequently dies from acute toxemia.

The Treatment of Fetal Toxemia.—Where the child survives its birth it requires especial attention. The bowels should be irrigated and equal parts of boiled water and salt solution should be given by the bowel at regular intervals for absorption. The skin should be thoroughly cleansed and the child wrapped warmly in blankets. If the weather is cold it should be kept in an incubator or in a heated basket until its nutrition is fully established. Minute doses of calomel, $\frac{1}{40}$ gr. with sugar of milk, should be given to stimulate the action of the liver, kidneys and bowels. As the child should not nurse the mother, it may be fed with albumen water and peptonized milk, well diluted. The intestinal tract should be irrigated once or twice in twenty-four hours and the fluid left for absorption. Care must be taken that, although the child is kept warm, it has abundant fresh air, and the inhalation of oxygen by a suitable mask will be found of advantage. If it survives, and a suitable wet nurse can be found for a short time, this will greatly improve its chances of life. Should the mother's toxemic condition improve and she recover ultimately, care must be taken to encourage the secretion of milk. The breasts should be gently massaged

and pumped at regular intervals, and upon her recovery the child should be put to the breast. If successful nursing can be established it will be of great benefit to mother and child.

If the child does not do well, the skin will remain dry, the urine will be very scanty, yellowish brick-red, and irritating, there will be dark-greenish discharges from the bowels, the child will rapidly lose weight, it will refuse nourishment and sometimes water, and will survive its birth but a short time. Before death the temperature may rise to a high point and the child may have typical convulsions.

The Differential Diagnosis of Toxemia in the Later Months.—Epilepsy in a pregnant patient may simulate toxemia with convulsions. While the convulsions themselves cannot always be differentiated the examination of the blood, the heart and the urine, should clear up the diagnosis; the gradual subsidence of the epileptic convulsions and the improvement of the patient establishes the diagnosis.

Hysterical patients in labor, or approaching labor, may counterfeit the convulsions of eclampsia. While the seizure itself may be typical, it will be observed that these patients have no convulsions without an audience. If left entirely alone in a quiet room the convulsions cease. Under observation they may recur.

In hystero-maniacal patients, convulsive seizures may simulate eclampsia. In these cases a history of previous hysteria may often be obtained, the patient becomes conscious between the attacks, and the examination of the blood and urine should clear up the diagnosis.

Among the insane the advent of labor pains may be followed by active maniacal convulsions; in rare cases of cerebral tumor in a pregnant woman at term labor has produced convulsions which were diagnosticated as toxemic and eclamptic.

The Recovery of the Toxemic Patient.—The patient who survives acute toxemia and the delivery of her child may have an uninterrupted or a prolonged and complicated recovery. In the latter, mental disturbance is a common feature. The patient may not become fully conscious after delivery and in several days this may be superseded by melancholia, and this in turn by acute mania. It is often neces-

sary to remove these patients to a hospital for the insane, where suitable appliances for restraint, and if necessary artificial feeding, are available.

The diagnosis in these cases for the life and the recovery of reason, depends upon the patient's heredity and the degree of virulence in the toxemic process. A patient with an acute insanity will escape death from toxemia and eclamptic convulsions, only to become chronically and hopelessly clouded in mind. If there is no heredity of mental disease and the patient be young and previously healthy, the prognosis for ultimate recovery, both in mind and body, is good.

During mental disturbance the patient should be isolated, the process of elimination stimulated, and so soon as possible nutrition pushed in every reasonable way. Such patients frequently have an extraordinary aversion to the child, and the child should not be with them. Cases have been known where a mother has seriously injured or destroyed the infant.

It cannot be too strongly urged that the severe toxemia of pregnancy, with or without convulsions, demands hospital care.

INFECTIOUS DISEASES COMPLICATING PREGNANCY. THE MOTHER

In some cases it seems that pregnancy tends to protect the mother against acute infection; thus a woman having several children may have one or two of her family ill with an acute infectious disease, and she in the pregnant condition may escape. This can only be explained by the increased percentage of immunizing substances found in the blood of the healthy patient. In other cases the mother yields to infection like other patients.

Typhoid.—Pregnant women often become infected with typhoid during the later months of gestation, the infection remaining latent until labor comes on, and during the puerperal period the temperature rises and the disease runs its typical course. In these cases diagnosis may be difficult, as it may be that the patient has a puerperal septic infection. A correct diagnosis is obtained by the Widal test and by excluding the signs, symptoms and lesions of puerperal sepsis. During pregnancy typhoid attacking a pregnant patient may

run a typical course. Abortion will not occur unless the temperature is persistently high, when pregnancy is usually interrupted.

Should this not occur, and the patient go to term, the fetus may be permanently injured, and the child may show the results of injury to the nervous system. In cases where the temperature is not high the child may show no ill-effects from the infection. There is reason to believe that typhoid bacilli pass through the placenta and that the fetus shares the infection of the mother.

Treatment.—Typhoid, like other infections, should be considered a complication of pregnancy, and not pregnancy a complication of typhoid. Under no circumstances should abortion be induced, but the mother should be treated as if not pregnant. Such will give the best chance for mother and child.

The mortality of typhoid complicating pregnancy depends upon the severity of the infection and the resisting power of the patient. The majority of cases recover without the interruption of pregnancy and without serious complications.

Pneumonia.—Pneumococcus pulmonary infection, croupous pneumonia, may run its typical course in pregnancy. The pneumococcus is occasionally found with other bacteria in septic cases, and the clinical picture is complex, the septic element predominating. The diagnosis and treatment of pneumococcus pulmonary infection of pregnancy is identical with that in the non-pregnant.

Catarrhal pneumonia, capillary bronchitis, may be a dangerous complication of pregnancy. The distention of the abdomen by the uterus and its contents, and the consequent labored respiration, tend to produce congestion of the lungs. This would complicate catarrhal pneumonia and interfere with the oxygenation of the patient's blood. The fetus shares the mother's disease, and may even survive her, as in a case under the writer's observation where the mother, attacked by catarrhal pneumonia, came into labor, giving birth to a living child and dying soon afterward. The child passed through a characteristic course of the disease and recovered.

The diagnosis of catarrhal pneumonia complicating pregnancy is made by the usual physical signs and symptoms and

the treatment is that of the non-pregnant, especial care being necessary to support the burdened circulation.

Cerebro-spinal Meningitis.—This dangerous disease when complicating pregnancy usually brings on labor or abortion. Its mortality is high, and the diagnosis may be confused by petechial eruptions which often occur in puerperal sepsis. Thus cerebro-spinal meningitis may be mistaken for sepsis because of high fever and eruption, and on the contrary, in the presence of an epidemic of meningitis, a patient with puerperal sepsis may be thought to have meningitis.

The differential diagnosis may be aided in some of these cases by the clinical test of anti-meningitic serum.

The Acute Eruptive Diseases.—The exanthemata when complicating pregnancy produce their characteristic lesions and symptoms in the mother and in the fetus as well. Children have been born with the characteristic eruption of measles, scarlatina, variola or varicella. As a rule, the exanthemata are severe in the pregnant woman. The control of temperature is an important part of the treatment and every means should be taken to favor the early and complete appearance of the eruption. Such a course will best conserve the interests of mother and fetus as well. Prolonged high temperature, with delayed eruption, usually brings on abortion or premature labor.

Vaccination.—The question is frequently raised whether vaccination against variola should be practised on pregnant patients. During the times when small-pox was present in the city the writer has repeatedly vaccinated patients at various periods of pregnancy with uniformly good results. There has been no extreme reaction, and in no case has pregnancy been disturbed. It is evident that the fetus must be protected by the vaccination, but for how long a time after birth it is difficult to estimate. If vaccination protects the mother for several years it should certainly protect the fetus for at least one year.

In general, it may be said that pregnancy is no contra-indication to the use of vaccines and antitoxins. On the contrary, the prompt control of infection by such means will tend to prevent abortion and allow pregnancy to go on to its natural termination.

Diphtheria.—Infection by the bacillus of diphtheria alone, without mixed infection, is susceptible to control by antitoxin, and is not a serious complication of pregnancy. The characteristic lesions may be found in the mucous membrane of the vagina, as well as in the throat. In the observation of the writer, a patient recovered from such diphtheria without the development of septic infection and without the interruption of pregnancy.

The diagnosis is made by bacterial culture and the prompt and thorough use of antitoxin is indicated.

Influenza.—One of the most dangerous diseases attacking pregnant patients is influenza. This arises from its tendency to produce catarrhal pneumonia and appendicitis, each of which is serious in pregnancy. Danger arises because mild cases of influenza are frequently neglected. The pregnant patient may not receive adequate treatment until she becomes seriously ill. Influenza is always a serious complication of pregnancy, and a mild attack should be treated by absolute rest in bed, with disinfection of the fauces and nares, and the use of suitable tonics. A laryngologist should be summoned in these cases and the nose and throat thoroughly inspected and disinfected. It may be necessary to repeat such disinfection for several days.

The Infection of the Bacillus Coli Communis.—This is one of the most common and often serious complications of pregnancy. The germ may attack the gall bladder, one or both kidneys, or the appendix and large intestine. It may gain access to the body through infected fluids, or may enter the blood through capillaries which are near impacted feces.

All forms of this infection are characterized by high leukocytosis, comparatively high temperature, and in severe cases by frequent rigors. If the patient receives no specific treatment the disease may run a favorable course, being severe in accordance with the focus of infection, and if the temperature be persistently high the fetal life will be lost. Fatal results occur from exhaustion and from the development of mixed infection, with streptococci and staphylococci.

Cholecystitis.—Many pregnant patients suffer from some degree of infection of the gall bladder during gestation. The symptoms are tenderness over the gall bladder, diffuse pain

in the right hypochondrium, often felt beneath the scapula, a furred and coated tongue, vomiting, often slight jaundice, moderately elevated pulse and temperature, leukocytosis, and the general symptoms accompanying an acute infection.

The prognosis depends upon the severity of the infection and when it becomes mixed a severe hepatic and septic infection may result.

Treatment.—Rest in bed, the free use of gentle laxatives, liquid diet, and lavage of the intestines, with the application of dry cold over the region of the gall bladder. In severe cases, with the patient in good general condition, the gall bladder should be incised and drained.

The Pyelitis of Pregnancy.—By this name is designated the infection of one or both kidneys by the bacillus coli communis. Usually the pelvis of the kidney is the site of the infection, in severe cases the kidney substance becoming thoroughly riddled. The mode of infection is through the urethra, bladder and ureters, through the blood stream, or from the presence of the over-distended right colon. The right kidney is most often affected, less frequently the left, and both kidneys comparatively rarely.

The differential diagnosis is made by the high leukocytosis, 20,000 to 25,000, and the persistent acid reaction of the urine which swarms with the bacillus coli communis. This germ does not decompose urea, and hence the urine remains acid. It does not also form an antitoxin.

The treatment of this condition consists in absolute rest in bed, lavage of the intestine, a milk and water diet, with the free use of urotropin or some other mild antiseptic of the urinary tract. Should the disease not yield to these measures local treatment may be instituted by catheterizing the ureters and irrigating the pelvis of the kidney with boric acid solution or salt solution.

Where the infection is limited to the right kidney it will cause characteristic pain in this region, and in thin women the kidney may become so large as to be recognized by palpation.

When medicinal and local treatment fail and the patient ceases to improve, or grows worse, the writer has had good results by exposing the right kidney through the usual lum-

bar incision. At each extremity a stitch of good-sized chromic catgut is passed through the inner layers of the wound and through the capsule of the kidney, and these stitches are tied. This practically secures the kidney in the wound, with its convex surface in the incision. This surface is then incised and the gloved finger passed through the kidney substance to the pelvis. A free discharge of dark blood follows this manipulation, and in this blood the bacillus coli communis has been found abundantly in pure culture. If the blood which exudes from the kidney is allowed to flow freely over the edges of the wound, infection may occur and pus may develop. A strand of gauze is passed through the kidney substance to its pelvis, the extremities of the wound are closed, and the kidney is allowed to drain externally. The kidney wound is allowed to close gradually.

In the writer's experience this operation has been successful, the patient recovering without the interruption of pregnancy.

If both kidneys be involved it is usually thought best to avoid active interference and to give the patient general treatment, with irrigation through the ureters.

Appendicitis.—While all appendicitis during pregnancy is not the result of the bacilli coli communis yet many cases are. The signs and symptoms are characteristic of the disease in the non-pregnant. The varying tenderness, so common during pregnancy, must be kept in mind in palpating the abdomen to outline the inflamed appendix. The presence of leukocytosis, the abdominal symptoms, and the patient's altered pulse and temperature, will confirm the diagnosis. In many cases the kidney and appendix are involved in the same patient at the same time, and we must believe that in many others the gall bladder is often the site of infection.

The removal of the affected appendix as soon as a diagnosis can be made is urgently necessary. If this be not done the infected appendix is a constant menace during pregnancy, and may rupture during labor, its contents infecting the peritoneum. Should the appendix perforate and abscess form, one wall of the abscess is usually made by the wall of the uterus. Should uterine contractions bring on labor, this

abscess will be ruptured, its contents escaping into the peritoneal cavity. Hence in operating for appendicitis at full term, it may be thought necessary to first empty the uterus by Cesarean section and then deal with the appendix and its abscess. In this way efficient drainage could be secured after the uterus had been reduced in size and the danger of rupture from the abscess wall had been avoided.

In these cases it is rare that one focus of infection only is present. In the writer's experience in pyelitis, the appendix is frequently involved, as well as in cholecystitis. The obstetrician must use his judgment should cases come to operation, and if appendicitis be suspected, although it may not be possible to accurately diagnosticate acute appendicitis, the appendix should be removed. This the writer has done in cases of pyelitis treated by drainage, with uniformly good results.

Syphilis.—One of the most important complications of pregnancy is maternal syphilis. The pregnant woman seems a good subject for this disease, and unless promptly controlled runs its characteristic course with severity and rapidity. The syphilitic eruption may be unusually active and be mistaken for variola. In these cases fever is high and the patient usually suffers from a mixed infection.

The diagnosis of syphilis contracted during pregnancy is made in the usual manner. The treatment consists in the prompt use of salvarsan, care being taken to make the dose proportionate to the development and vigor of the mother. In cases which do badly with salvarsan the biniodid of mercury has been successfully used, and in the later stages the iodides. The local lesions should be persistently and thoroughly disinfected to avoid the development of mixed infection. Knowing the frequent tendency of syphilis to cause abortion the obstetrician must treat these cases promptly and thoroughly. Should abortion occur, mixed infection is to be dreaded and avoided. The genital tract should be disturbed as little as possible, and every precaution should be taken to secure the entire discharge of the ovum.

Gonorrhea.—Infection of the gonococcus complicating pregnancy may become severe and dangerous with the de-

velopment of mixed infection. The gonococcus alone rarely produces severe symptoms or dangerous conditions. Cystitis is a frequent development in these cases, because the functions of the bladder are disturbed so often by the growing uterus. Confusion in diagnosis may also happen, because the patient may develop gonorrheal rheumatism, and this may be mistaken for multiple septic infection. The vaccines of gonorrhea may be tried in these cases and good results are reported. The usual treatment of absolute rest and milk and water diet, the use of laxatives, and later in the disease local antisepsis with counter-irritants, will usually be found successful.

Tuberculosis.—The tubercular woman who becomes pregnant may be apparently benefited by pregnancy. There may be increased appetite, better weight and color, and apparently the patient's power of resistance is enhanced. So soon, however, as the pregnancy is over the tubercular processes become more active than before, and usually proceed rapidly to a fatal issue. This fact has led to much discussion concerning the propriety of terminating pregnancy as soon as possible in a tubercular patient. The majority of observers believe that in young primiparæ whose powers of assimilation are good, and where proper surroundings can be obtained, that it is unnecessary to interrupt pregnancy because of tubercular infection. In multiparæ, and especially those debilitated by repeated childbirth, pregnancy should be promptly interrupted, with the possible hope of prolonging or saving the mother's life.

The usual treatment of tuberculosis in the nonpregnant is indicated with pregnant patients. Fortunately the latter often respond more vigorously than do patients who are not pregnant.

THE FETUS IN ACUTE INFECTIOUS DISEASES

The fetus shares in the acute infection of the mother and its consequences. It has been repeatedly observed that bacilli pass from mother to child through the placenta. Hence the fetus may have the mother's disease while in utero, and in cases where the mother's temperature is high, and she has rigors, the fetal movements may be unusually

active. In acute malarial intoxication the mother's chills and fever may be accompanied by fetal movements so active that one must conclude that the fetus has rigors as well.

There is no specific treatment which can be used in these cases for the especial purpose of preserving the life of the child. So-called specific medication may be freely used and seems in many cases to be successful.

Syphilis affects the fetus so profoundly that it is the greatest cause of fetal mortality. Its lesions in the fetus are so characteristic that they furnish a separate chapter in fetal pathology.

Fetal Syphilis of Paternal Origin.—Where the mother is sound and the fetus syphilitic, the mother may escape infection through increased resistance on the part of her tissues, which causes the formation in the uterus of thickened endometrium; so a patient having given birth to a syphilitic fetus, although she may herself escape syphilis, has a chronic endometritis.

The characteristic fetal lesions are seen in the viscera and in the nervous system, the skin and its appendages. The liver is considerably enlarged, a characteristic eruption of reddish copper color is found about the anus and genital organs and may develop over the body; there is chronic catarrh, the color of the child is pale and yellow, and the general appearance that of premature age and decay. The epiphyses of the long bones show a layer of yellow material between the shaft and the cartilage. Fetal death usually occurs through changes in the liver or in the central nervous system.

Syphilis is the most frequent cause of abortion. When this happens after the placenta has formed, areas of yellowish-gray tissue are seen throughout the placental substance. The oxygenating power of the placenta is gradually lessened until death of the fetus occurs. Before the placenta has formed syphilitic changes in the vessels of the chorion cause hemorrhage and the death of the embryo.

Where the mother is syphilitic and the father sound, the embryo may escape active syphilis, especially if the mother receives vigorous anti-syphilitic treatment. When both parents are syphilitic the death of the embryo is the result.

Fetal death is followed by maceration, which may obscure somewhat the characteristic lesions.

The treatment of syphilis in the embryo is the vigorous treatment of the mother. In this it must be remembered that anemia is one of the dangerous conditions developing during syphilis. If drugs be given that act vigorously upon the syphilitic germ they must not be allowed to interfere with the general nutrition of the patient, so the use of arsenic and iron, with selected feeding, is indicated. Where the mother has lost embryos repeatedly through syphilis, anti-syphilitic treatment, accompanied by curetting, may enable her to produce a living child.

Parasitic Diseases.—While we are comparatively familiar with the pathology of malaria, other parasitic diseases of more recent discovery have not yet been thoroughly studied. The fetus shares the mother's malaria, and like her, benefits by the use of quinine and other drugs. The fear that quinine given in these cases in large doses may produce abortion is unfounded if the patient be in the active stages of malaria.

Pernicious and severe malarial intoxication may interrupt pregnancy. In this, as in other acute diseases, the general rule must be followed, that the mother must be treated as if she were not pregnant, and that under no circumstances should abortion be produced.

CHRONIC DISEASES, POISONING, AND ACCIDENTS COMPLICATING PREGNANCY. DISEASES PRODUCING DEGENERATIVE CHANGES

Acute rheumatic infection in mother and fetus may be followed by the development of endocarditis and permanent damage to the heart and vessels. Heart disease complicating pregnancy is serious in proportion to the severity of the disease and the extent and location of the lesion. The mitral valve is most frequently affected, causing mitral insufficiency or a mitral obstructive lesion. Aortic disease may also be present, and so may alterations in the pulmonary valve. Cardiac lesions may be diagnosticated in the usual manner by physical examination. Murmurs are not of positive value, for such are not infrequently found during pregnancy in patients without valvular lesion. Of especial moment are

the size of the heart, as made out by percussion, the character of its muscular action as obtained by auscultation, and the presence or absence of an interval between the contraction of the ventricles and its pulse-wave. From this we may learn whether compensation has been effected, whether it is maintained, and whether the lesion is or is not obstructive.

The management of heart disease complicating pregnancy depends for its success on the general condition of the mother. Realizing the added tax which pregnancy brings upon the circulation, all additional burden must be avoided. Abundant rest, fresh air, the avoidance of strain and apprehension, are imperative. The patient's nutrition and excretion should receive careful attention, and drugs should not be given to influence the action of the heart unless absolutely necessary. In proportion to the compensation present, gentle exercise is indicated, either active or passive. If anemia be present, this must be corrected.

The interruption of pregnancy may become necessary in heart disease. Rapidly falling compensation, beginning edema of the lungs, and other portions of the body, inability to sleep, dyspnea, and prostration, indicate that pregnancy must cease. If the mother earnestly desires the life of the child every effort may be made to prolong gestation, until viability is assured. When labor occurs, the additional muscular strain of parturition may greatly oppress the heart, causing cyanosis, dyspnea and syncope. To relieve the patient's distress ether may be inhaled with oxygen, and the labor terminated as speedily as possible. Moderate bleeding is sometimes useful. Cardiac tonics should be given during labor, and so soon as the uterus is emptied.

No apparent effect from cardiac disease of the mother has been observed with the fetus, but in proportion as her vigor is impaired, the vigor and development of the child may also be lessened.

Heart lesions in the fetus are usually congenital and may result from failure of the Eustachian valve to close. This produces partial asphyxiation which may become complete at any time after birth. Such children are partly cyanosed in color, with rapid feeble heart action and sluggish circulation. They require stimulation from birth.

Degenerative Disease of the Viscera Complicating Pregnancy.—Arterio-sclerosis antedating pregnancy may become aggravated during gestation. This would cause degeneration of the heart muscle, increase in atheroma in the vessels, distention of the walls of veins, the development of varicosities, and multiple hemorrhages from rupture of capillaries. Chronic interstitial nephritis may develop, and if toxemia be added the condition may culminate in eclampsia.

Pregnancy is dangerous with these patients and strict attention must be paid to hygiene if pregnancy is to safely continue. In severe cases abortion occurs from hemorrhage in the ovum, with degenerative changes in the vessels of the chorion or placenta.

Acute Degenerative Disease.—Probably from septic infection the maternal liver during pregnancy may undergo an acute degenerative process, known as acute yellow atrophy. This is usually accompanied by high fever and symptoms of severe septic intoxication. There is intense jaundice and mental disturbance, and sometimes delirium. The exact cause of the lesion is not clearly known, but the symptoms point to acute infection. The disease is fatal and treatment beyond palliation is unavailing.

Acute Degenerative Processes in the Fetus.—The fetus shares with the mother in lesions in the vessels of the viscera, produced by acute degenerative disease. In atrophy of the liver the placenta is bile-stained, the child is jaundiced, and in its organs shows changes corresponding with those in the mother.

The success of salvarsan in syphilis has led to the hope that it may also be useful in other forms of infection. It has been found efficient in some parasitic disorders which produce rapid disintegration of the blood and degenerative changes in the viscera. It would seem rational to hope that it may be as efficient in correcting diseased conditions in the fetus as in the mother.

The Influence of Maternal and Paternal Infection Upon the Offspring.—This important question often comes to the attention of the observer, and usually in relation to syphilis. While those who treat syphilis are sanguine as to the possibility of complete cure and the production of healthy off-

spring by those who have been syphilitic, the obstetrician sees many cases in which this hope ends in disappointment. In syphilis not only must persistent treatment be employed, but abundant time must elapse for the development of secondary and tertiary symptoms, and their absence must be proven before it can be hoped that syphilis has been cured. It is, however, possible, where the syphilis is maternal, and the father is sound, to so improve the condition of the mother by active treatment that she may give birth to a non-specific comparatively vigorous offspring. In common with other diseases, pregnancy is often a great stimulus to diseased processes when it occurs after the original infection, so in tuberculosis and syphilis if pregnancy is added to the original disease pathological conditions will develop with increased vigor and rapidity. Increased knowledge of infectious and parasitic diseases should explain many hitherto unknown causes of abortion and should tend to diminish this complication of pregnancy.

THE EFFECT OF POISONS UPON MOTHER AND CHILD

Pregnant women are exposed to poisons in occupations in which poisonous chemicals are used, by accidentally taking poisons and occasionally through suicide.

Arsenic, lead, and poisons which give off irritant fumes, such as nitric acid, seriously injure the mother and the fetus as well. The absorption of arsenic produces irritation of the intestine and kidney, and disorders of the skin and nervous system.

The fetus shares with the mother in this complication and if violent vomiting and purging ensue abortion usually occurs. Lead produces obstinate constipation, palsy and frequently causes the death of the fetus. Irritant fumes cause chronic bronchitis, preventing oxygenation of the blood, and violent coughing often produces abortion. Mercury produces salivation, diarrhea, nephritis and, where the poisoning is long-continued, dysentery and abortion.

Among those poisons which act more slowly and affect the nervous system profoundly, is tobacco. Pregnant women working in tobacco factories suffer from nausea and vomiting,

paresis and abortion. If they go to term the amniotic liquid is discolored, and there are evidences that absorption from tobacco interferes with the development of the child.

Alcohol, except in the smallest quantities, is a direct poison to the fetus if taken by the mother. There is abundant evidence to show that it seriously interferes with the growth and development of the fetus and that its effects are especially disturbing upon the nervous system. Unfortunately, abortion is less common than with more irritant poisons, but rarely happens unless the mother has delirium tremens, or receives mechanical injury while intoxicated. Opium and other narcotic substances interfere with fetal growth and development.

Direct violence, caused by the rapid and jarring motion of machinery, is a frequent cause of abortion among pregnant women working in factories. This is especially frequent where machinery must be controlled by the feet, or where the foot treadle is used.

In cases of attempted suicide, if irritant poisons, like arsenic, be taken and the mother vomits and purges violently, should she survive the poison, abortion is apt to occur through mechanical separation of the ovum. Where carbolic acid is taken the rapid and deadly action of this substance upon the blood of the mother produces asphyxiation in the fetus. If narcotics be used, the child also dies from gradually developing asphyxia.

Poisoning during pregnancy should be treated as in the non-pregnant. Suffering should be promptly allayed with opium, given hypodermatically, and this will have the further purpose of preventing abortion, if possible. If a viable child is born from a poisoned mother, efforts should be made to sustain its circulation and to secure the elimination of the poison. Artificial warmth and the use of oxygen by the pulmotor are indicated.

ACCIDENTS

Pregnant women, if healthy, often survive severe accidents without abortion. This fortunate result depends greatly upon prompt and efficient treatment following the accident. If shock be combated, and anesthesia be skilfully produced

during operation, the patient may be carried through her recovery without abortion. To secure this result, pain and restlessness must be prevented as completely as possible. Pregnant women, if healthy, bear mechanical injury and hemorrhage comparatively well. The interruption of pregnancy depends much upon the nature of the accident. Should the abdominal and pelvic regions be the site of injury abortion is almost inevitable. Other portions of the body may be severely injured, and still the fetus escape. In gunshot and stab-wounds of the abdomen the fetus may be wounded or killed by the original injury to the mother.

In the later months of pregnancy mechanical violence is especially dangerous to the fetus through separation of the placenta. Thus a pregnant woman thrown from a car or carriage or falling a considerable distance may not receive severe or fatal injury, but placental separation may expose her to the dangers of hemorrhage and septic infection, and may cause the death of the child. In this, as in other cases of accident, the patient must be put to rest at once, opium given to secure quiet, and such stimulation as may be necessary. Should a surgical operation be performed anesthesia should be as brief as possible, pain and restlessness are to be feared after operation, and the patient should be controlled after the anesthesia by opium.

In accidents which prove rapidly fatal to the mother, if the child be viable, and heart sounds be heard, the fetus should be immediately extracted from the body of the mother by Cesarean section.

ABNORMAL CONDITIONS OF THE PELVIC ORGANS COMPLICATING PREGNANCY

If pregnancy be complicated by disease of the pelvic viscera, the mother is exposed to additional danger and the life of the fetus is also at stake. Where the mother has had inflammation in the abdomen, and the uterus, tubes and ovaries are adherent to the intestine, the natural development of the uterus may be prevented, the mother will suffer pain from stretching, and traction upon adhesions, and abortion may be threatened. Infection of the intestines, whether appendicitis or colitis, is peculiarly severe because of the mechanical

stasis in the abdomen and is very apt to cause abortion. Chronic appendicitis or colitis is frequently lighted up and made acute by pregnancy.

Where pregnancy occurs in a patient who has suffered from salpingitis with adhesions, interference with the development of the uterus, pain and possibly the rekindling of inflammation, may ensue. Should severe disturbance be

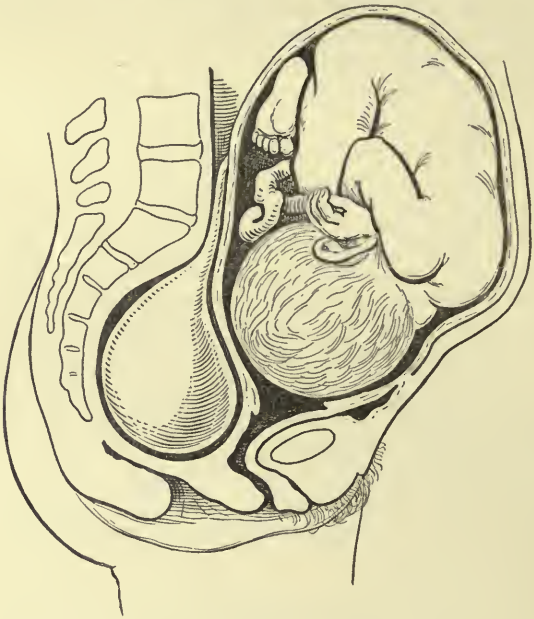

Fig. 35.—Pregnancy complicated by ovarian tumor.

caused abortion may result. Where this complication develops the mother must be put at once at rest, sedatives given to control pain, the intestinal canal kept empty, and the patient's strength and nutrition supported. The use of heat or cold upon the abdomen is attended with some risk, and caution must be exercised. Where the patient does not grow better with such treatment, if indications for operation arise such should be undertaken.

Pelvic tumors complicating pregnancy, if ovarian, are dangerous to the mother because of their tendency to twist the pedicle. For this reason an ovarian tumor should be removed so soon as discovered. Rapidly growing ovarian cysts may lead to error in diagnosis and may be mistaken for pregnancy with polyhydramnios; so also may polyhydramnios be confused with ovarian cyst.

One of the most frequent abnormal conditions of the uterus complicating pregnancy is the presence of fibroid growths. If such be submucous and attached at the lower uterine segment, it may form an obstacle to labor. During labor the tumor may be retracted and the head forced below it, or the tumor may present in front of the head, or head and tumor may become impacted in the pelvis.

Interstitial fibroid growths may so weaken the uterine muscle that labor does not develop normally. The diagnosis of this condition may be difficult during pregnancy, as no tumor is felt by palpation. Such patients usually require section for delivery, when the character of the tumor will become apparent. Should no sound uterine tissue be found at the site of incision the operation must be terminated by hysterectomy. Sub-peritoneal fibroids rarely complicate pregnancy unless they become of excessive size. Fibroid tumors of the uterus share in uterine involution after the birth of the child. Small tumors usually disappear, in some cases enucleated fibroids become polyps and are sometimes forced out from the uterus. Sub-peritoneal tumors become smaller.

The treatment of pregnancy complicated by fibroid tumors of the uterus depends upon the circumstances of the individual case. If the patient be in good condition and the tumor is so situated that it will afford an obstacle to birth, myomectomy may be performed in the interests of mother and child. If the tumor fills the pelvis and myomectomy is impossible, an effort may be made to displace the tumor, allowing the child to descend, and if such fails delivery by section with hysterectomy is indicated. In cases where a fibroid tumor is large and surrounds the uterine cavity, pregnancy may supervene and may not be detected until hysterectomy is performed. Fibroid tumors may exert a very unfavorable influence upon pregnancy by causing profound anemia. In

these cases medical treatment may be of service, and should this fail myomectomy or hysterectomy must be performed.

Cancer of the uterus complicating pregnancy usually grows very rapidly. The extirpation of the uterus is indicated so soon as the diagnosis is made. In cases where the condition is not discovered until the child is viable, a brief

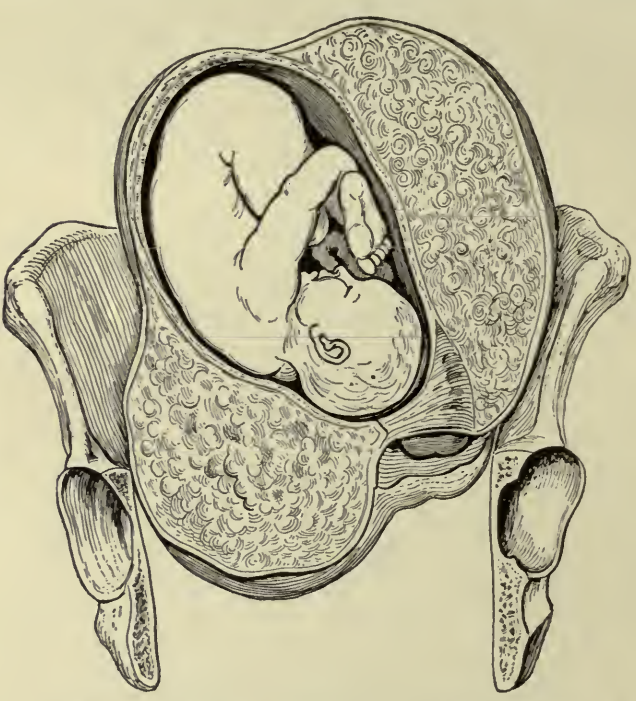

Fig. 36.—Pregnancy complicated by uterine fibroids.

delay may be permitted, the mother being in good condition, to secure established viability. The children in these cases are usually ill-nourished and weak, and hence in early pregnancy no effort should be made to preserve the life of the fetus.

Malformations of the Generative Organs.—In some cases where the uterus has failed to develop normally the original

partition between the two halves remains, and a so-called double uterus results. An impregnated ovum may lodge in one of these cavities, leaving the other empty. Should uterine development permit, pregnancy may go to term and a living child be delivered. Should there be danger of uterine rupture the patient should be delivered by section. Malformations in the lower portion of the generative tract are sometimes observed and must be dealt with in accordance with the nature of each case.

Malpositions of the Pelvic Viscera Complicating Pregnancy.—A frequent and often serious complication of pregnancy is retroversion of the uterus. This may have preceded conception, the patient not being aware of the condition until the growth of the uterus caused pain. In other cases the uterus was not originally retroverted, but in the first weeks of pregnancy became so, often through a sudden effort at lifting or straining.

While a retroverted pregnant uterus may develop normally for a short time, its increase in size must sooner or later cause pain and distress, thus drawing attention to the condition.

Among the most pronounced symptoms is irritability of the bladder. A retroverted womb makes traction upon the fascia and pelvic peritoneum about the bladder, in some cases almost occluding the urethra. Retention of urine frequently results, unless care be taken to empty the bladder by catheter. Enormous distention may gradually result with decomposition of the urine, and severe cystitis. Abortion frequently results from pressure upon the growing uterus, while the ovum may die within the womb and finally be expelled as a blighted ovum.

The diagnosis of retroversion of the pregnant womb is made by combined examination, the outward hand placed behind the pubis failing to find the fundus. Internal examination shows a softened cervix directed upward behind the pubis, while the fundus fills the space in the posterior wall of the pelvis. It is usually possible to make out the lower uterine segment, except in neglected and infected cases.

Treatment.—A pregnant patient with retroversion should be put to bed if possible, under the care of a nurse. She should lie upon her side, and the nurse should see that the

patient's urinary bladder is frequently emptied. The bowel should be completely emptied by high injection, and the patient given liquid food with toast. An effort should be made to replace the uterus by placing the patient in the knee-chest posture, and with two fingers carrying the uterus to one side of the promontory of the sacrum and forcing the fundus up above the brim of the pelvis. Should this effort give the patient much pain the obstetrician must desist. When the uterus cannot be immediately replaced a continuous but very

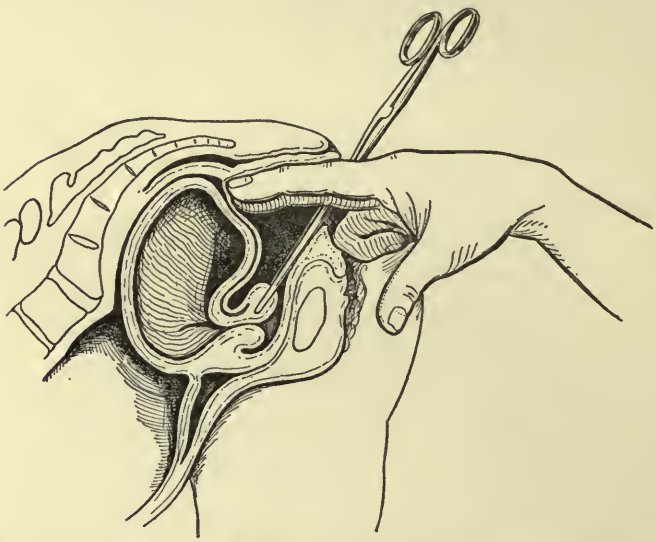

Fig. 37.—Replacing the pregnant womb when retroverted (after Bumm).

gentle effort should be made by inserting tampons of carded wool soaked in one per cent. lysol, and they should be renewed at least as often as every two days. When the tampons are changed a vaginal irrigation of one per cent. lysol should be made. During this treatment the patient should be under intelligent care, and in bed or on a couch, not lying upon her back. After the uterus has been replaced an elastic soft rubber ring pessary may be worn to advantage until the uterus is so large that it cannot get into the pelvis.

With this the patient may usually resume her accustomed life, gradually avoiding lifting and straining, and taking the knee-chest posture night and morning until the uterus is so large that it cannot enter the pelvis.

Should the uterus remain in the hollow of the sacrum and the embryo die, infection may develop and a dangerous condition supervene. In such a case it may be safest to remove the uterus through the vagina to save the mother from fatal septic infection.

Prolapse of the ovaries, with or without adhesions, may complicate pregnancy and occasion severe pain as the uterus increases in size. Beyond palliation nothing can be done until the uterus has become an abdominal organ. Should evidences of pyosalpinx be present, operation must be undertaken, when the ovaries should be freed from their adhesions and restored to their normal place.

Prolapse of the pelvic viscera may interfere with the normal course of pregnancy, expose the mother to considerable suffering, and threaten abortion. It is usually best to palliate in these cases, keeping the uterus within the pelvis by tampons until its growth is such that it cannot prolapse. Operation and permanent cure should be undertaken when the patient has recovered from parturition.

Hernia, abdominal, inguinal or pelvic, complicating pregnancy, can usually be controlled by pads or trusses until pregnancy has terminated. In urgent cases operation must be undertaken.

Atresia.—In patients who have had severe previous infection, or who are badly developed, the cervix, vagina or vulva may be largely occluded and spontaneous birth impossible. Patients occasionally come into labor without any discernible external os. Careful examination discloses a small aperture, admitting a probe. Under anesthesia this should be gradually enlarged, and if it does not readily yield to satisfactory dilatation the cervix should be deeply incised, and birth accomplished. Where the cervix, vagina, pelvic floor and vulva have been the site of some destructive inflammation preceding pregnancy, the parts may be so contracted and so incapable of dilatation that delivery by section may become necessary.

Abnormal Conditions in the Pelvic Viscera Resulting from Previous Operation.—Operations undertaken to secure dislocation or diseased conditions of the pelvic viscera may leave the patient in such condition that pregnancy cannot go to term, and spontaneous birth becomes impossible.

The various operations done to cure prolapse and dislocation of the uterus often cause serious trouble in pregnancy. Ventro-suspension and ventro-fixation produce most serious complications. Here the anterior uterine wall is so greatly limited in mobility and development that the fetus grows in the posterior portion of the uterus and may over-stretch the posterior uterine wall to the point of rupture. To attempt to deliver the child through the vagina is always dangerous, and delivery by abdominal section is indicated. Adhesions should then be severed and the uterus brought into proper position. If this cannot satisfactorily be done the operator must perform hysterectomy.

Prolapse of the pelvic viscera, complicating pregnancy and preceding it, may be permanently cured by delivering the patient by section at full term, removing the body of the uterus and fastening the stump in the lower end of the abdominal incision with a clamp or by suture. With this position the uterine stump draws the prolapsed tissue upward, the broad ligaments are also drawn above, and a firm scar forms at the lower end of the abdominal incision, which effectually prevents prolapse and cures the condition.

ABORTION

By abortion is understood the expulsion of the product of conception before viability—26 weeks. Patients dislike the word abortion because they hear of criminal abortion, and they constantly use the word miscarriage instead. Premature labor is the expulsion of the fetus after viability and before full term.

The Causes of Abortion.—This may be maternal, paternal or embryonal. Maternal causes are largely those diseased conditions of the endometrium which prevent the formation of normal decidua and the adhesion of the ovum. The pathology of this condition is the pathology of endometritis. Diseased conditions of other viscera which influence the

endometrium may indirectly cause abortion, such as chronic nephritis, gout, and syphilis.

Dislocation of the uterus, which renders normal uterine growth impossible may cause abortion; so also may the growth of pelvic tumors. Direct violence to the mother by lifting or straining or disturbance of the genital tract, or traumatism by a fall, a blow, or other injury, may produce abortion. Prolonged high temperature in acute infectious disease so destroys the oxygenating power of the mother's blood as to cause abortion. An unstable condition of the nervous system may produce such irritability of the uterine muscle that it contracts upon very slight disturbance and expels the embryo. Exertion during times when menstruation should have occurred may produce congestion in the pelvic viscera, followed by apoplexy in the ovum and abortion. Improper and tightly applied clothing may force the uterus out of position and cause it to expel its contents. Extremes of heat or cold sometimes produce abortion. Shock or great excitement may so disturb the nervous system as to destroy the embryo. Chronic poisoning or acute irritant poisons may cause abortion.

Paternal Causes of Abortion.—Among the paternal causes of abortion, syphilis is the most important. This so vitiates the embryo that normal development is impossible, hemorrhage occurs in the chorion, and the embryo dies and is expelled. Chronic poisoning in the father and a chronically debilitated condition may render the impregnated ovum incapable of prolonged development.

Ovular Causes of Abortion.—Abnormalities in the development of the embryo may render its complete growth impossible. By far the most frequent ovular cause of abortion is hemorrhage, usually in the chorion. Syphilis may produce this, chronic poisoning from acute infection, or toxemia may bring this about.

The mechanism of abortion is usually the same, with hemorrhage into the placental decidua and into the chorion, followed by separation of the ovum from the uterine wall, with its death and subsequent expulsion.

The Blighted Ovum.—While the impregnated ovum has died, it can still be retained within the uterus. It is then

termed a blighted ovum. If it is expelled the process is said to be abortion. The retention of a blighted ovum is more dangerous than abortion because the syncytium covering the villi of the chorion may not die but proliferate, attacking the mother's tissue and producing syncytioma malignum. The retention of fetal tissue within the uterus is dangerous because it tends to produce malignant growth, and hence all such tissue should be expelled as soon as possible after the death of the ovum.

Tubal Abortion.—When the impregnated ovum lodges in the Fallopian tube and its development distends the tube, if the ovum be near the fimbriated extremity the muscular and elastic tissue of the tube may contract and force the ovum through the fimbriated extremity. Such is called tubal abortion. Rarely the ovum attaches itself to pelvic or abdominal tissues, and may develop to term. It is usually destroyed by the cells of the peritoneum.

The Diagnosis of Abortion.—The cardinal symptoms of this accident are pain and hemorrhage. The pain is usually low in the back, radiating to the front. It is severe in proportion to the vigor of uterine contractions. It may resemble the pain of lumbago, or the suffering produced by intestinal colic. Like a miniature labor, the pains increase in intensity until the expulsion of the ovum, when relief usually follows. The hemorrhage in abortion is bright in color, the blood clotting if the ovum has but recently separated from the uterine wall. If, however, separation has been going on gradually, and the ovum is partly attached, or if separation occurred at some previous time and the blood was retained, the blood will clot feebly and be dark in color, resembling prune juice. The amount of the hemorrhage varies in accordance with the physical characteristics of the mother and the extent of the separation of the ovum. Hemorrhage is rarely so great as to produce syncope or to threaten life.

The Differential Diagnosis.—Abortion must be differentiated from painful menstruation, menorrhagia or metrorrhagia. In painful menstruation pain and hemorrhage occur at the regular time, there is no previous history or symptom of pregnancy, and the blood discharged does not clot.

Abortion is frequently accompanied by free hemorrhage

PLATE I

Abortion at eighteen weeks, fetus and placenta 20 cm. long (Davis, Treatise on Obstetrics).

and this may be confused with menorrhagia, but in the latter there is no history of pregnancy and no previous symptoms. The character of the discharge is also of value in making the diagnosis. In metrorrhagia there is a history of endometritis, of fibroid growth in the uterus, malignant disease, or some other condition which accounts for the bleeding.

Threatened, Inevitable and Incomplete Abortion.—By threatened abortion is understood pain and hemorrhage which gradually ceases without the death or expulsion of the embryo. By inevitable abortion is understood pain and hemorrhage which cannot be made to cease and which finally culminate in abortion. By incomplete abortion we understand the retention in the uterus of some portion of the ovum or its appendages.

The habit of abortion, or chronic abortion, is sometimes used to designate the condition of the pelvic organs and the general health of the patient, which makes a continuance of pregnancy impossible. It is sometimes difficult to find an anatomical cause for this abnormality. Conception occurs and pregnancy goes to a certain point and then terminates; and in repeated pregnancies the same accident happens. Among animals epidemic abortion may usually be traced to septic infection, but in the human subject the habit of abortion is often inexplicable.

Pathology.—The essential pathology of abortion is hemorrhage into the decidua or chorion. Extravasated blood acts as a foreign body and produces additional hemorrhage and separation of the ovum from the uterine wall. While the mother is sound and the initial separation has resulted from violence, the blood may clot, further hemorrhage be prevented, and sufficient of the embryo remain adherent to secure its further development. Acute infections produce hemorrhage and separation by their destructive influence upon the blood. Diseased conditions of the endometrium lead to degeneration of capillaries and extravasation of blood. Abnormalities in embryonal development may cause apoplexy in the chorion and separation. The fact that the embryo is frequently expelled enveloped in a blood-clot should emphasize the essential nature of the pathology of abortion.

The Prevention of Abortion.—Abortion may be prevented by removing its cause. Most common of those which can be controlled is direct disturbance of the generative tract. Among working women, lifting and straining are frequently followed by abortion. The enactment of laws which prevent the employment of pregnant women in laborious occupations endeavors to remove a frequent cause of abortion. Second only in importance to the avoidance of direct mechanical violence is the doing away with those causes which produce great mental or nervous disturbance. Mental shock or continued anxiety may result in the death or expulsion of the embryo. The need of absolute rest is shown in those cases of repeated abortion where a patient does not pass through pregnancy successfully until she is made to remain in bed for weeks or even months.

The general care of the pregnant patient is most important in preventing abortion. The regulation of clothing, the avoidance of toxemia by proper food and attention to digestion and excretion, the avoidance of very hot or very cold baths, the insistence upon a normal physiological life, all tend to prevent abortion.

A pelvic examination should be made in each case of early pregnancy to determine that the uterus is in normal position so that it may develop without interrupting pregnancy. The patient, to avoid abortion, must exercise especial care at those times when menstruation would otherwise have occurred. Rest in bed for several days and the avoidance of all strain and exertion are imperative. Those circumstances which generally exhaust, depress and excite, are to be avoided if abortion is to be prevented. The pregnant patient should not go into great crowds, nor take long and uncomfortable journeys, nor be shocked by horrifying spectacles or other depressing influences.

A belief that abortion can be avoided is often a powerful factor in preventing it. Drugs are of value only in so far as they calm the nervous system or correct diseased conditions. The most prolonged effects produced by drugs are seen in the treatment of syphilis, or of the acute infectious disorders where drugs destroy the infective organism, and thus prevent abortion. Much can be done to prevent abortion if

simple directions by reputable medical men are circulated freely among married women.

The Treatment of Abortion.—*The Treatment of Threatened Abortion.*—When abortion threatens, the patient must be put at absolute rest under competent care. Opium in the form of rectal suppositories containing from ½ to 1 grain of the aqueous extract should be inserted in the rectum sufficiently often to quiet pain. If the patient can retain it she should be given by the mouth bromide of sodium with tincture of hyoscyamus and fluid extract of viburnum prunifolium. If the stomach rejects this, a suppository containing codein, hyoscyamus and viburnum may be used instead. Easily digested liquid food must be taken, and all interruption and disturbance should be absolutely prohibited. The patient should use a bed-pan and remain absolutely quiet. Soiled dressings, clots and other material expelled, must be saved for the inspection of the attending physician. If the ovum does not entirely separate, but remains sufficiently adherent to live, hemorrhage will gradually cease, pain will disappear, and pregnancy go on. Should hemorrhage continue and grow more profuse, pain becomes stronger and more rhythmical, the ovum will be expelled and abortion is inevitable.

The Treatment of Inevitable and Incomplete Abortion.—So soon as it is evident that abortion is inevitable, measures must be taken to secure the entire expulsion of the ovum and decidua to control hemorrhage and to prevent infection. Anesthesia is often required for this purpose if the patient's condition justifies it. Under antiseptic precautions the vagina should be thoroughly sponged out with 1 per cent. lysol, the bladder emptied by catheter, the cervix seized by tenaculum forceps and dilated sufficiently by solid dilators, if necessary, to permit the introduction of one or two fingers. If the fingers of the gloved hand cannot reach the fundus, a large blunt-edged spoon-shaped curette may be gently passed over the uterine wall and whatever is not attached brought away. The uterus may then be gently but thoroughly irrigated with 1 per cent. lysol, and tamponed firmly with 10 per cent. iodoform gauze. The vagina should be sponged clean with gauze and a vaginal packing of bichloride gauze inserted.

The pressure of the gauze brings about the prompt and early discharge of the ovum and decidua, prevents hemorrhage, and the gauze acts as a drain. Liquid food, laxatives, tonic doses of strychnia and ergot, and antiseptic care, are needed. The gauze may be removed in from forty-eight to sixty hours after its insertion and portions of the ovum and decidua will usually be found adherent to it. Only a vaginal douche is needed when the gauze is removed. No douche should afterwards be given. If all of the ovum has not been discharged the remaining fragments will be expelled without difficulty in a few days. During convalescence the patient should wear antiseptic vulvar dressings, and should be kept thoroughly clean with antiseptic solution. As much attention should be given to the mother's complete recovery as if she had had parturition at full term. Subinvolution often occurs, because the mother misses the stimulus of the nursing child to secure uterine contraction. If infection develops, adhesions and thickening of the pelvic tissues may be the consequence. Before discharging the patient as cured a bimanual examination should be made to ascertain her condition.

The Treatment of Chronic Abortion—When a patient habitually aborts, a very thorough examination of both husband and wife, if possible, is necessary. In the case of the husband, syphilis or other chronic poisoning must be excluded, and it must be ascertained that he is in good general health.

In the case of the wife, the condition of the reproductive organs must be ascertained as accurately as possible. If the uterus is not in normal position it must be restored, and if chronic inflammation be present in the pelvic organs, this must receive attention. Most cases require a thorough dilatation under ether, followed by curetting, with the application of an astringent and alterative, such as tincture of iodine.

The mother's general health must receive attention, and anemia or gout or chronic infection of any nature must be dealt with. If the patient be nervous and apprehensive she must be built up in every possible way.

A careful history is required in these cases to ascertain at what period of gestation abortion has occurred. If pregnancy follows the treatment, the patient should be put at

rest in bed for several weeks before and after the time of previous abortion. It is often necessary to confine the patient to bed for the first four months of pregnancy. Much can be done if patients are instructed as to what is dangerous to pregnancy, and how to so order their lives as to reduce the danger of abortion to the lowest possible degree.

Therapeutic Abortion.—When the continuation of pregnancy threatens the mother's life, pregnancy must be ended. This decision must be accepted by the patient and must not be made until the obstetrician is sure of his ground, and if necessary consultation should be held. If the patient has conscientious scruples against interrupting pregnancy, the responsibility for its continuance becomes hers.

Patients requiring therapeutic abortion are usually greatly reduced in strength and the power of resistance. Anesthesia is necessary, but such should not be prolonged, and ether should be employed well diluted with oxygen. Under antiseptic precautions the cervix should be dilated sufficiently to introduce one or two fingers. No effort should be made to curette the uterus, but after dilatation its cavity should be firmly packed with 10 per cent. iodoform gauze and the vagina tamponed to conclude the operation.

This procedure immediately destroys the life of the ovum, and in cases of pernicious nausea usually ends the nausea at once. The gauze may be allowed to remain for from forty-eight to sixty hours, when the ovum will come away with it or be discharged shortly afterward. The decidua may not be entirely expelled for several days. Under antiseptic precautions and with antiseptic dressings afterward, infection should not follow this procedure.

The other methods of inducing therapeutic abortion are too uncertain, too slow, and too apt to cause infection, to be worthy of trial.

Criminal Abortion.—The term criminal abortion is applied to the wilful destruction of the embryo without adequate cause. It is done in cases of illegitimate pregnancy, or where married women will not allow pregnancy to continue.

The method of producing criminal abortion varies, but in most cases a sound or rod of some sort is thrust into the uterus. This pierces the envelope of the embryo, often wounding the

decidua, causing hemorrhage and the death of the embryo. Criminal abortionists make no effort to remove the product of conception, but aim solely to destroy its life. Women often attempt, and sometimes produce, abortion upon themselves by introducing pieces of whalebone or wire within the uterus.

Fig. 38.—Perforation of a retroflexed uterus by a curette, introduced to bring on abortion (Liepmann).

Following criminal abortion there is usually severe and often prolonged hemorrhage. As few abortionists practice antiseptic precautions infection frequently occurs. As every effort is made to conceal the crime the patient does not obtain competent medical advice until she is severely ill, hence the

mortality and morbidity of criminal abortion must remain high. Death usually occurs from septic infection and its complications, and should recovery follow the patient is often left with chronic pelvic peritonitis and its consequences. Foreign bodies are sometimes thrust through the vagina into the abdominal cavity, into the bladder or rectum, and various injuries follow attempts at abortion.

When a patient in the child-bearing age is brought to the attention of a physician with the symptoms of pelvic peritonitis and with a vaginal discharge of bloody fluid, criminal abortion must be suspected. The physician should first cooperate with the authorities of his city or town and notify them that he has been summoned to the case, without necessarily giving the name of the patient. This should be done so that if possible a clue can be obtained to the perpetrator of the offense, but the treatment given by a reputable physician should not in any way injure the patient. As these patients are infected, they require tonic and stimulant treatment. No effort should be made to operate upon them unless the indications are pressing. By the time they are seen by a reputable physician the blood has become infected, so that local treatment is of little value. If the patient survives the operation, but remains with a normal temperature for some time, she should be thoroughly examined to ascertain the condition of the pelvic organs. Or if she survives abortion and develops pyosalpinx or pelvic abscess, it is evident that pus must be evacuated from the pelvis or an infected tube removed. Should the patient become critically ill the legal authorities must be immediately notified and all information possible obtained to trace the criminal.

The duty of the physician in these cases is often difficult, for he must not betray the patient's confidence, and yet he must not shield the abortionist. Criminal abortion is a crime punishable in most states by imprisonment and fine, and should be considered a crime by the medical profession. No reputable physician can think of such a procedure.

PART III

LABOR

By labor is meant the spontaneous expulsion from the mother's body of the fetus and its appendages.

CHAPTER XI

THE CAUSES AND TREATMENT OF LABOR

Various theories have been advanced to explain the causation of labor, but that which is most reasonable recognizes the toxemic state of the mother's blood from materials derived from both fetal and maternal tissues to be the exciting cause. This irritates the nervous system and fetal movements excite uterine contractions and bring on fetal expulsion. Unquestionably changes in the placenta by which its vessels become to some extent obliterated, tend to excite partial asphyxiation in the fetus, producing violent motions and exciting labor. Labor may also be caused by mental and nervous excitement and by the action of some drugs, as purgatives, notably castor oil.

Labor usually occurs at what would have been a menstrual crisis had the patient not conceived. Just preceding menstruation the blood pressure is usually increased and this aids in exciting labor. In attempting to compute the time of labor, one must ascertain the patient's individual history concerning menstruation—what her average intervals have been, and what the duration and character of menstruation has also been. Many patients who have children repeatedly show a tendency to come into labor at the same hour in the twenty-four, and some terminate pregnancy at practically the same day at each confinement.

THE MECHANISM OF LABOR

By the mechanism of labor we understand the adaptation of the fetus to the mother's birth canal and the phenomena which accompany its expulsion. As the vertex most often presents the mechanism of this labor must first be considered.

Fig. 39.—First position, vertex presentation before rotation has begun.

VERTEX PRESENTATION

The Stages of Labor.—Labor is commonly divided into a first, second and a third stage.

The first ends when the cervix is completely dilated, whether or not the membranes have ruptured. The second terminates with the expulsion of the fetus; the third with the delivery of the fetal appendages.

While during the first stage there seems to be little of a mechanical nature, the important phenomenon of engagement

and descent are then developed. By engagement is meant the fitting of the presenting part into the patient's pelvis. To accomplish this the head must be so placed that its shorter and not its longest diameters will be brought in relation with the pelvic brim. As there is the most room in the oblique diameters of the pelvic brim, so the fetal head will engage and descend in these diameters. This is made possible by the flexion of the fetal head which brings the occipito-frontal di-

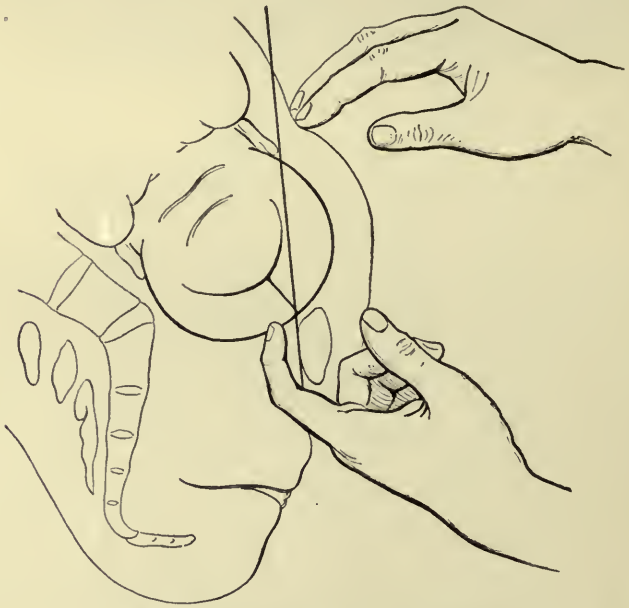

Fig. 40.—Fitting the head into the pelvis.

ameter 12½ to 12¾ cm. in relation with the right oblique at the pelvic brim 12½ to 13 cm. In the left diameter of the pelvic brim is engaged the biparietal diameter of the head. Flexion is promoted by the resistance which the chin experiences as it impinges against the posterior wall of the pelvis. This forces the chin against the sternum of the fetus and develops flexion fully. Engagement is complete in proportion as flexion is thoroughly developed and the head descends

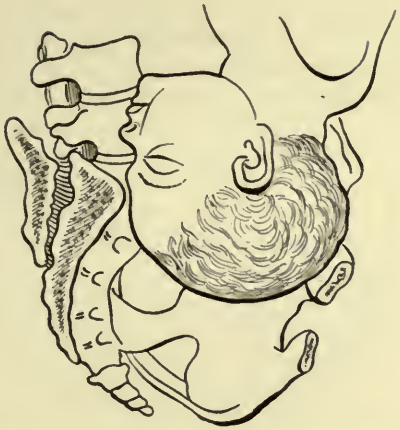

Fig. 41.—Spontaneous labor, head engaging.

Fig. 42.—Complete flexion with descent; first position, vertex presentation.

through the pelvic brim. Engagement cannot be said to be complete with the head merely lodged in the pelvic brim and showing no evidence of descent.

Under the influence of repeated and increasing uterine contractions the head enters the pelvic cavity. Here there is room for the turning of the head in its flexed position in any direction. The descent of the head through the pelvic brim has been followed by engagement of the shoulders. The bisacromial diameter entering in the left oblique diameter of the pelvic brim passes down through the pelvic cavity; the head reaches the pelvic floor upon which it at first rests obliquely.

Fig. 43.—Descent; occiput beneath the pubes; rotation almost complete.

During its passage it may have borne against the side of the pelvic wall in front of the spines of the ischia, the contour of the pelvic wall favoring its anterior rotation. At the pelvic floor the head is exposed to two opposing forces, the downward pressure of uterine contraction aided by that of other muscles, and the upward pressure of the elastic and muscular tissue of the pelvic floor. The weakest portion of the pelvic floor is at the entrance to the vagina beneath the pubes. The vertex naturally turning in the direction of least resistance under the influence of two opposing forces turns from left to right, the vertex gradually distending the vulva and appear-

ing beneath the pubes. Flexion is maintained by the resistance of the pelvic floor acting upon the face. As the head descends to the pelvic floor and appears in the vulva it al-

Fig. 44.—Rotation complete; the head upon the pelvic floor and opening the vulva.

ternately advances and recedes, the pains being usually stronger and weaker in alternation. The vertex gradually descends to the vulva while the pelvic floor is drawn strongly upward to resist the pressure of the head, which results in

Fig. 45.—The head expelled over the pelvic floor.

extreme flexion. When the greater portion of the head emerges through the vulva the occiput is strongly pressed upward beneath the pubes and the pelvic floor gradually retracts until it passes over the face and chin. The head then

emerges, the occiput immediately turning toward the left side of the mother toward which it was directed within the uterus.

The shoulders engaging in the left oblique diameter of the pelvis pass through the pelvic cavity, the left or posterior

Fig. 46.—The face emerging over the pelvic floor by extension.

shoulder impinging upon the pelvic floor, while the right lodges beneath the symphysis pubis. By strong lateral flexion of the trunk the left shoulder is forced over the pelvic floor and appears in the vulva, when the right also becomes dislodged, and the birth of the remainder of the child's body

Fig. 47.—The upper right shoulder pivoting beneath the pubes; the left posterior shoulder on the pelvic floor; the occiput points to the left.

speedily follows. At the moment of birth the child's back is directed toward the mother's left side. The essentials in the mechanism of spontaneous labor consist in the adaptation of the child to the mother's birth canal, and its rotation

in the direction of least resistance to permit its expulsion. The forces engaged are the contractile power of the uterine muscle supplemented by all the muscles of the trunk, and at times by the voluntary use of the upper and lower extremities to steady and to sustain the trunk. Opposing this are the elastic tissue and the muscular forces of the pelvic floor.

The Mechanism of Labor, Vertex Presentation, Second Position.—In the second position, the mechanism of labor is essentially the same as in the first, excepting that the direction of rotation is opposite; so in vertex presentation, first

Fig. 48.—The right upper shoulder pressed strongly against the pubes, delivering the posterior shoulder over the pelvic floor.

position, the vertex rotates from left to right; in the second position from right to left. In vertex presentation, first position, the upper shoulder rotates from right to left; in vertex presentation, second position, the upper shoulder rotates from left to right.

THE MECHANISM OF LABOR IN FACE PRESENTATION

In face presentation extension is substituted for flexion. The back of the child is directed toward the left side of the mother's body, the face toward the left, and anteriorly, the chin toward the right, and posteriorly. Complete extension brings the depth of the head at the submental bregmatic diameter in relation with the right oblique of the pelvic

brim, while the bitemporal diameter is in relation with the left oblique of the pelvic brim. The shoulders, as in ver-

Fig. 49.—Face presentation, first position, the hand entering the pelvic cavity.

Fig. 50.—Face presentation without extension, constituting brow presentation. The descent of the head in this position is impossible.

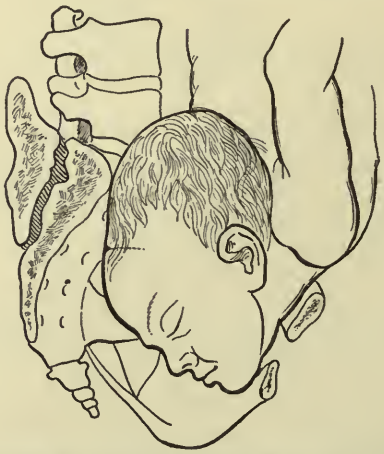

Fig. 51.—Face presentation with good extension, the face on the pelvic floor, the chin rotated anteriorly beneath the pubes.

tex presentation, are in relation at the left oblique of the pelvic brim. As descent occurs the contour of the head is

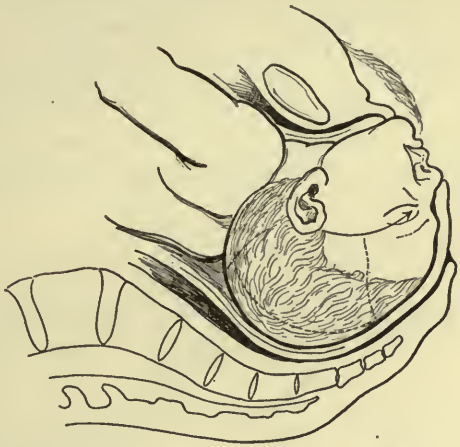

Fig. 52.—Face presentation; the chin anterior beneath the pubes; birth of the head by flexion of the cranium over the pelvic floor.

Fig. 53.—Face presentation; the face emerging, the head on the pelvic floor distending the perineum.

such in extreme flexion that the chin first reaches and impinges strongly upon the pelvic floor. The resistance which

it encounters turns it in the direction of least resistance and it rotates beneath the pubes, the chin appearing in the vulva. The occiput rotating posteriorly is in the hollow of the sacrum. By uterine and abdominal pressure the chin is forced tightly up beneath the pubes and by a motion of flexion the occiput is expelled over the pelvic floor. The descent, engagement and expulsion of the shoulders is the same as that in vertex presentation, first position. After the head has emerged it turns with the face directed toward the left side of the mother.

Fig. 54.—Face presentation; the head completely born.

Face Presentation, Second Position.—In face presentation, second position, the mechanism is identical with that of first position, except that the head engaging in the left oblique diameter rotates from right to left, while the shoulders engaging in the right oblique diameter rotate from left to right. For the mechanism of labor to be complete in face presentation extreme extension must persist, otherwise the occipitomental diameter of the head will be brought in relation with a pelvic diameter smaller than it, and impaction of the head may result.

THE MECHANISM OF LABOR IN BREECH PRESENTATION

In breech presentation the bistrochanteric diameter of the fetal body engages in the right oblique of the pelvic

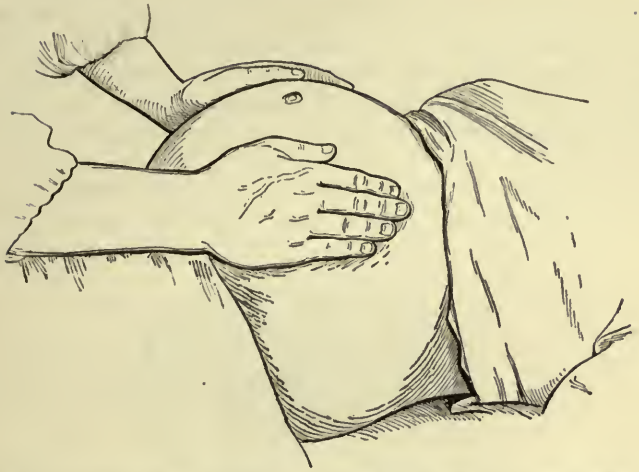

Fig. 55.—Breech presentation; palpating the head in the upper portion of the uterus.

Fig. 56.—Breech presentation, first position, with the back anterior.

brim and readily descends to the pelvic floor. In the left oblique diameter of the pelvic brim is the thickness of the child's body, which in normal cases is never sufficiently great to interfere with the normal mechanism of labor. The shoulders of the child and body descend in the pelvis, following the hips. At the pelvic floor the breech of the child rotates from right to left, the left hip and thigh engaging beneath the symphysis pubis, while the right hip and thigh are

Fig. 57.—Breech presentation, first position, with the back posterior.

forced downward over the pelvic floor. The shoulders with their bisacromial diameter have engaged in the right oblique diameter of the pelvic brim, and thus descend until the pelvic floor is reached, when the left anterior shoulder rotates from left to right and engages beneath the pubes, the arms normally remaining flexed and closely applied to the child's chest. The right and posterior shoulder passes over the pelvic floor and the shoulder emerges, the child's back turning toward the

left side of the mother's body. The after-coming head of the fetus descends through the pelvic brim in a flexed position, the suboccipito-bregmatic diameter engaging in the right oblique diameter of the pelvic brim. In the left oblique diameter of the pelvic brim is the bitemporal diameter of the

Fig. 58.—The body born down to the shoulders, the right shoulder pivoting beneath the pubes; the left upon the pelvic floor.

head. During the birth of the body the flexed head rotates from left to right, the face coming upon the pelvic floor, the occiput beneath the pubes. As the body is raised over the mother's abdomen the head passes over the pelvic floor with extreme flexion, the face being closely applied to the pelvic floor and perineum.

The Mechanism of Breech Presentation, Second Position.—In this the trunk of the child's body descends through the pelvic brim in the left oblique diameter, the bistrochanteric

Fig. 59.—Breech presentation, the head normally in the pelvic cavity, the occiput in front.

Fig. 60.—Breech presentation; normal birth of the head, the body raised.

Fig. 61.—The head passing out of the vulva, the body held perpendicularly.

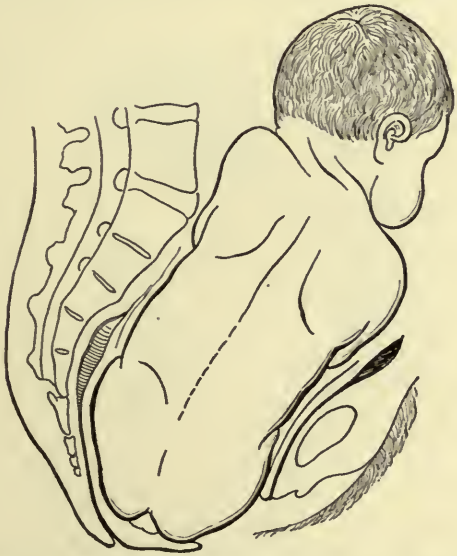

Fig. 62.—Breech presentation, second position, the breech descending upon the pelvic floor.

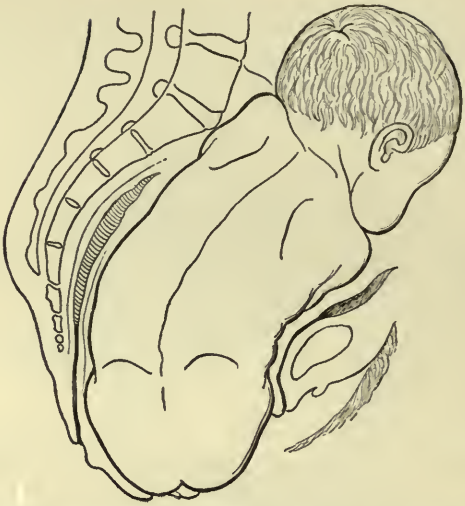

Fig. 63.—Breech presentation, second position, the anterior hip (the right) beneath the pubes; the left upon the pelvic floor.

Fig. 64.—Breech presentation, second position; the hips expelled by strong lateral flexion of the trunk.

engaging in the left oblique diameter of the mother's pelvic brim. The thickness of the child's body above the pubes enters in the right oblique diameter.

As the breech of the child reaches the pelvic floor the left or anterior hip rotates from right to left beneath the pubes and the right or posterior hip passes over the pelvic floor. The shoulders descend in the pelvic brim in the left oblique diameter, the anterior or right shoulder rotating to the pubes and engaging beneath it, the left or posterior shoulder then passes over the pelvic floor. The head in strong flexion passes through the brim of the pelvis with its bitemporal diameter in the right oblique, its suboccipito-bregmatic in the left oblique. As the head reaches the pelvic floor in strong flexion the face gradually appears in the vulva, the vertex being tightly applied beneath the pubes. By a motion of extreme flexion the head is finally born.

CHAPTER XII

THE PHYSIOLOGY OF LABOR

THE MATERNAL PHYSIOLOGY OF LABOR

Labor on the part of the mother is an intensely active muscular exertion in which all of the voluntary muscles of the body are called into play. The actual expulsion of the fetus is effected by the contractions of the uterus, aided by the fixation of the diaphragm and the contraction of the abdominal muscles.

By virtue of the anatomical distribution of its muscular fibres the uterus contracts symmetrically, compressing its contents and forcing the fetus from above downward. The enlarged round ligaments of the uterus contract with its expulsive muscle, drawing the uterus forward and bringing it into the axis of the pelvic brim. The uterine contractions are rhythmical, beginning gradually, reaching their highest point, and subsiding. With the exception of the few contractions which immediately expel the presenting part the uterine contractions alternate in length and severity, a vigorous powerful contraction being succeeded by one much less long and severe. In natural labor the period between uterine contractions is quiescent and the patient is free from pain.

The first contractions of the uterus are comparatively short in duration and of moderate strength only. Their function is to dilate the cervix, and fit the presenting part into the pelvic brim and cause it to descend below the promontory of the sacrum. During this, the first stage of labor, the patient complains of pain commencing in the back and passing on both sides to the front of the body. The pains are said to be nagging, sharp and more or less distressing, causing considerable suffering. In a healthy woman, if the patient be up and about, her attention may be diverted and

she may scarcely notice these pains. In cases where the nervous system is obtunded by drugs or disease the first stage of labor is often not perceived. During dilatation of the cervix a free secretion of mucus is exuded by the cervical glands, which is blood-tinged from small lacerations in the mucous membrane. This discharge is called in common language "the show." The pains of the first stage of labor are sometimes not distinguished from intestinal colic, irritability of the bladder, or neuralgic or rheumatic muscular pain.

The uterus is roused to full activity by the rupture of the membranes and the discharge of amniotic liquid, which brings the uterine muscle to contract directly upon the fetus. As uterine contractions increase in force and in length, to steady the diaphragm the patient fixes the chest by grasping some object with both hands, sometimes aiding herself by pressing her feet against a support, closing the mouth, and pressing strongly downward, the diaphragm being fixed, thus securing the aid of the abdominal muscles to the work of the uterus. This is called "bearing down." The entire muscular system may be brought into activity during this act, the muscles and skin are filled with blood, the surface of the skin is reddened, its temperature increased, and slight moisture forms upon the surface of the body; the pulse becomes strong and regular, and between muscular efforts the patient rests, sometimes dropping asleep. The expulsive efforts of the mother culminate in very strong contractions as the head is forced out over the pelvic floor. Its birth is followed by a short period of rest and then the shoulders are expelled, the body readily escaping. A pause of from half an hour to an hour then ensues, during which the uterus contracts and retracts, gradually lessening the area of placental attachment. The placenta gradually leaves the uterine wall and passes into the lower uterine segment and cervix, where it is folded together, its edge presenting in the vagina.

The second stage of labor ends with the expulsion of the fetus, the third stage commencing with the extrusion of the placenta. This is accomplished by causing the patient to bear down strongly when the abdominal muscles press upon the uterus, exciting uterine contraction and adding their

force, which results in the expulsion of the placenta. The uterus gradually enlarges until it reaches the umbilicus when it undergoes gradual contraction, until finally during the puerperal period it should regain very nearly its original dimensions.

The action of the uterine and other muscles is under the direct control of the ganglia and nerve fibres supplying these muscles. The uterus itself cannot be made to contract at the will of the patient, but its contractions can be lessened or prevented by the inhibitory action of the brain and spinal cord. Thus excessive suffering and pain may check uterine contractions and delay labor, while the administration of a stimulating anesthetic, like ether, may take the brake off from uterine action, when the ganglia of the uterine muscle supply automatic stimulus for its muscular contraction.

In common with all muscular contraction, labor produces rapid waste in the muscles and is dependent for its success upon the normal action of the nerve and muscle as well. It is a supreme test of the woman's natural powers, but results badly in patients in whom the muscular and nervous systems are imperfect and without coördinate action.

During labor the heart of the patient is taxed to supply blood to the muscles. In normal cases the heart responds to this need by acting more strongly, regularly and steadily. Increased heart action increases blood pressure and in many cases produces a free secretion of urine; hence the common clinical maxim that the patient's urinary bladder must be emptied regularly and at short intervals during prolonged labor. Increased muscular action calls for a free supply of oxygen to maintain the normal character of the blood; hence the patient must be in a well aired room and should frequently breathe deeply and regularly during the active stage of labor. Many patients complain when the confinement room becomes close. As labor proceeds the surface of the body is reddened, and its temperature increases by the free circulation of blood through the skin and by muscular action.

When the birth of the child occurs the sudden ending of muscular activity causes the veins to dilate and the patient often complains of cold, and may have a slight rigor. The perspiration upon the surface of the body becomes clammy

and creates a feeling of chill. This is a temporary phenomenon, and as the circulation becomes adjusted it passes away.

Excretion During Labor.—Nature usually takes care of the increased waste incident to labor without detriment to the patient. Free secretion of urine, perspiration and exhalation through the lungs, relieve her of waste material. Unless the bowel has been previously emptied its contents may be expelled during the birth of the child. The loss of water through the skin or in vapor through the lungs is considerable, and the patient after the birth of the child frequently complains of thirst.

The Nervous System During Labor.—No test for the condition of the nervous system is more searching than that of labor. In perfectly sound and healthy patients labor proceeds quietly without undue delay, the patient experiencing only what would be normal fatigue by corresponding muscular exertion from any other cause. Regular alternation between muscular contraction, with rest, is an excellent proof of a normal and stable nervous system. When on the contrary there is no rest, but a constant complaint of pain and suffering, the patient is becoming exhausted or is physiologically unfit for the strain of parturition. In extreme cases the weakness of the nervous system becomes manifest after labor by attacks of syncope or shock, often so severe as to be alarming.

The duration of spontaneous labor varies greatly, and no arbitrary division can be made of its several stages. It has long been thought that the second stage of labor should not last more than two hours, yet spontaneous parturition with living child is possible where the second stage is greatly shortened or considerably prolonged from this arbitrary limit.

The exhaustion of labor is commonly so great that the patient sleeps so soon as it is over. This, like rest between pains, is a cardinal sign of a healthy nervous system.

THE PHYSIOLOGY OF LABOR PERTAINING TO THE FETUS

While the mother's part in labor is intensely active, that of the fetus is passive. Before the membranes rupture it is subjected to no direct pressure and often shows no sign of

stimulation through increased motions. Patients sometimes say that the child is quieter when labor begins than it has been previously.

After the rupture of the membranes some of the amniotic liquid which was before the head escapes, the head presses directly against the dilating cervix. If all the amniotic liquid is lost the pressure upon the fetus becomes at once considerable. The effect of such pressure is to interfere somewhat with the placental circulation and to cause temporary and partial asphyxia. In prolonged labor this becomes so pronounced that fetal movements are increased in rapidity and strength. Where labor is unduly continued the pressure may become sufficiently great to bring about the death of the fetus through asphyxia, and sometimes by hemorrhage into the fetal body. Almost all infants are born somewhat asphyxiated, which shows how readily this result can be brought about by abnormal birth pressure. The birth of the head is often followed by slight respiratory movements from the stimulus of the external atmosphere upon the child's face. The beginning of respiration will depend upon the occlusion of the umbilical vessels and the separation of the placenta.

In impacted labor birth pressure may be sufficient to cause the expulsion of meconium from the child's intestines and sometimes to empty the bladder.

At birth, if the umbilical cord be strongly beating respiration may be delayed for some minutes. Slight respiratory movements will result from the altered temperature into which the child comes and the irritation to its skin. As the umbilical vessels become gradually occluded respiration will normally be established. The fetal lungs do not at once expand entirely, but sufficient air enters to maintain the action of the fetal heart.

CHAPTER XIII

THE CONDUCT OF LABOR

The conduct of spontaneous labor must follow the cardinal obstetric signs to be successful. The obstetrician must stand ready to interfere and to help if the natural forces fail. The necessity for interference can only be perceived by accurate observation on the part of those who know the physiology of normal labor.

Much of the success of spontaneous parturition depends upon the vigorous condition of the patient, which can only be secured by good care during pregnancy. When this is present, and the obstetrician knows that the birth canal is normal and the fetus proportionate in size, he may await the natural development of labor without concern.

FIRST STAGE

During the first stage if the patient is under intelligent care his presence is rarely needed. The patient should be prepared for labor by thoroughly emptying the lower bowel with a copious injection, and by seeing to it that the urinary bladder of the patient is frequently emptied. In hospital cases a tepid soap and water bath should be given with the patient standing. The hair should be braided or otherwise arranged conveniently, and the patient clothed in old linen which can be torn if necessary. The antiseptic preparation of the external parts should commence by clipping or shaving the hair upon the pubes, followed by thorough scrubbing of the external genital organs with soap and water. After this boiled water should be used copiously, and then a solution of bichloride of mercury, 1:4000, or lysol one per cent. A sterile vulvar dressing should be retained in position by a T-bandage. The purpose of this dressing is two-fold—to guard against the entrance of septic bacteria, and to give an

opportunity to determine the nature and quantity of the vaginal discharge.

The preparations for labor should not be too hurried as regards the patient, unless labor is precipitate. It is desirable to divert the patient's attention as much as possible from the nagging pains of dilatation, and her preparation serves a useful purpose.

During the first stage of labor there will usually be an opportunity to give the patient nourishment. Such should be liquid of the most nutritious and digestible character, in many cases excluding milk. Small quantities of nourishment given as frequently as the stomach will permit, is best. Where dilatation of the cervix is rapid, vomiting may occur, and this has been held as an indication of a short and speedy labor.

If the patient is accustomed to tea or coffee this may be taken in moderation during the first stage of labor.

The patient should be encouraged to be up and about as much as possible during the first stage, to aid in the descent of the presenting part and to divert her attention. She should be made as comfortable as possible, and her surroundings should be as cheerful as circumstances permit.

Should the first stage be prolonged the patient will require sleep. Efforts should be made to procure this without drugs, by isolating the patient for a short time in a well ventilated and slightly darkened room. Should this not be successful, milder sedatives, such as bromides, may be employed.

During the first stage of labor a nurse should prepare the patient's bed, and have ready such dressings and solutions as may be required. A copious supply of hot water is demanded and unless the physician has otherwise ordered he should be notified that labor has begun. If the patient lies down, she should lie on the left side, toward which the fetal back is directed, with the lower limbs partly flexed. This facilitates the descent of the presenting part and its rotation.

THE SECOND STAGE

Remembering that dilatation is often complete before the membranes rupture, the attendant should judge more by the character and severity of the pains than by the rupture of the

membranes, in determining the progress of labor. When expulsive pains begin the medical attendant should be summoned and the patient should be thoroughly examined. As the pains increase in severity the patient's constant demand may be for anesthesia or for some drug to mitigate her suffering. It is unwise to use anesthetics unless labor is so far advanced that if necessary the obstetrician can terminate it immediately by forceps or version. As the pains become vigorous the patient must lie down upon that side toward which the presenting part of the fetus and its back are directed. The patient usually demands that someone should grasp her hand or rub her back during this period. The abdomen and the uterus should not be massaged under normal conditions.

As the fetus descends the uterus will grow smaller in the abdomen and the fundus project forward. Corresponding with the alternating character of the pains the presenting part will advance and then recede, thus avoiding continuous pressure upon the maternal parts. Where this phenomenon of alternating advance and recession are absent, the condition becomes pathological and may demand active interference. The attendant should take care that the patient's urinary bladder is thoroughly and frequently emptied during the second stage of labor. When the head reaches the pelvic floor the use of ether well diluted with air is indicated, and this should preferably be administered by an experienced physician. Ether should only be given during the most severe pains and should not be commenced until considerable dilatation is present. By using ether at the summit of a pain the patient's suffering is lessened without checking the progress of labor. During the intervals of rest care should be taken that the patient be not disturbed. She should not be spoken to, the room should be absolutely quiet, and an effort made to induce a few moments of natural sleep.

As the moment of expulsion approaches the obstetrician must decide what he will do to prevent laceration of the perineum and pelvic floor. Unless his methods be wisely chosen and properly carried out it would be better for his patient if he did nothing. It must be remembered that the most important portion of the pelvic floor is the levator ani

muscle whose anterior border marks the anterior limit of the pelvic floor. The posterior vaginal wall and the fourchette are composed of elastic tissue which will readily tear and whose integrity is not indispensable for the patient's health. In fact, a tear through this tissue to the edge of the muscle, provided it be clean cut and in the centre line, is not of primary importance. If, however, the fascia which attaches the levator ani muscle in its various branches to the pelvis be injured, prolapse of the genital organs will surely develop.

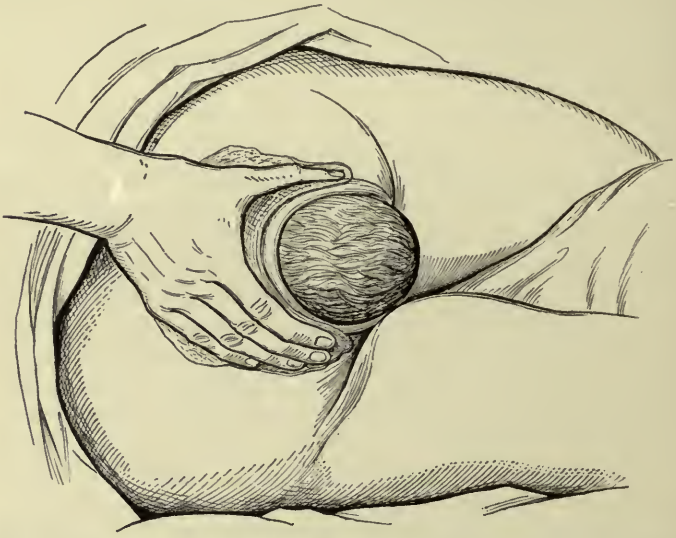

Fig. 65.—Protection of the pelvic floor; spontaneous birth, the patient in the left lateral position.

Whatever method of protecting the perineum and pelvic floor be employed it must be such as not to hinder the exit of the head and to permit, if necessary, laceration in the centre line of the soft tissues. On the other hand, the head should be directed moderately forward toward the pubes to prevent the exercise of undue force upon the perineum and the pelvic floor. The rate at which the head passes out of the mother's body is important, as very sudden and violent birth may pro-

duce serious laceration. To accomplish this, the patient lying upon the left side, a folded pillow covered with a sterile towel or a roll covered with sterile material, should be placed between the knees. This will permit the obstetrician to do what is necessary in controlling the birth of the head.

Standing or sitting with his face toward the feet of the patient the obstetrician passes the left hand between the patient's thighs, resting the curved fingers upon the vertex

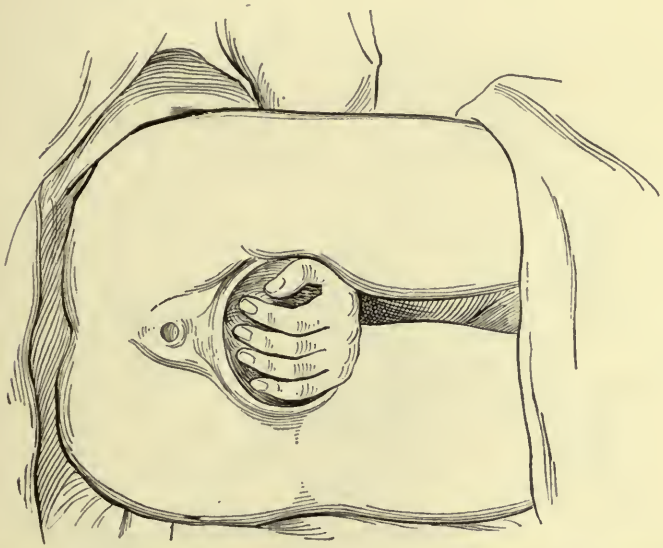

Fig. 66.—Holding back the head in spontaneous labor when sudden expulsion is threatened.

of the child's head as it emerges. With this hand the rate of exit may be controlled and the occiput carried gently upward. Should a violent pain threaten to force the head out suddenly the left hand should be placed over the head, and over this the right hand, and strong traction be made upward and backward. To protect the pelvic floor and perineum gauze or sterile linen wet with bichloride solution 1:4000, may be taken in the palm of the obstetrician's right hand, and the hand placed over the anus. This should not extend suffi-

ciently high to prevent the obstetrician from seeing the posterior wall of the vagina and the entire skin perineum. With the right hand, as the head comes down, moderate pressure may be made upon the pelvic floor upward and backward, and the head gently but steadily directed upward toward the pubes. As the head comes further in the vulva it may be held by the left hand, while the right hand may carry the distended pelvic floor and perineum backward

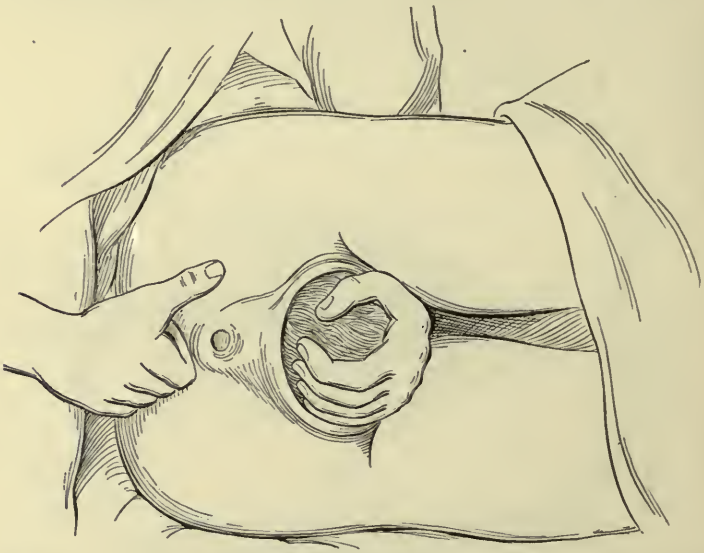

Fig. 67.—Delivering the head under the control of the obstetrician, between the hands.

toward the mother's coccyx. In this way the parts are stretched naturally and without undue violence or traumatism.

When it is evident that the pelvic floor can readily be stripped backward over the head and face, the left hand should hold the vertex gently but firmly up beneath the pubes, while the right hand should retract the pelvic floor and perineum over the child's face.

During this time the patient requires rapid anesthesia,

sufficient to make her completely unconscious for the moment. This can be readily done by skilful administration, and patients often assert that they can hear voices and sounds, although they had no sensation. This brief but efficient anesthesia is sometimes called *obstetric anesthesia*, and is dependent upon the skilful use of small quantities of ether well diluted with air, and also upon the condition of the pa-

Fig. 68.—Delivering the posterior shoulder.

tient herself. Rapid breathing in a parturient woman frequently causes a condition of temporary anesthesia, which may sometimes be utilized.

The interval occurring between the expulsion of the head and the shoulders should be utilized by the attendant in thoroughly but gently wiping the region of the child's eyes with soft sterile linen dipped in boric acid solution. The mouth

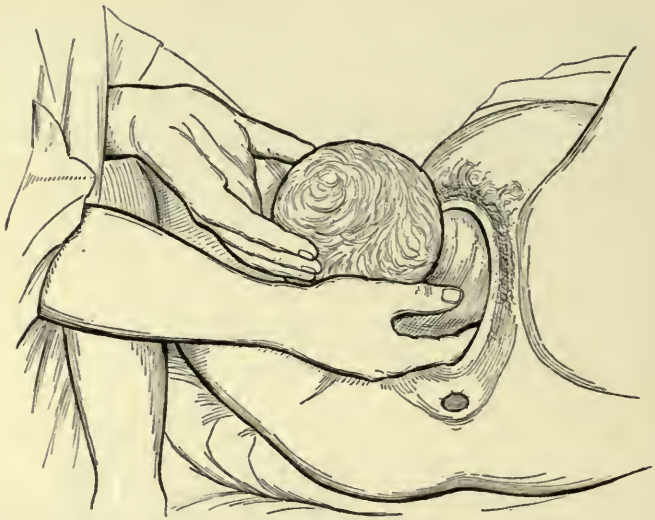

Fig. 69.—Raising the posterior shoulder over the pelvic floor and perineum.

Fig. 70.—Drawing down the anterior shoulder beneath the pubes.

should also be cleansed, and care taken not to wound the mucous membrane of the mouth.

After a varying interval expulsive efforts should again begin and the shoulders be born, followed by the rapid passing of the remainder of the body. The child should immediately be placed upon its right side and in such a position that it will not inspire blood or amniotic liquid which the mother

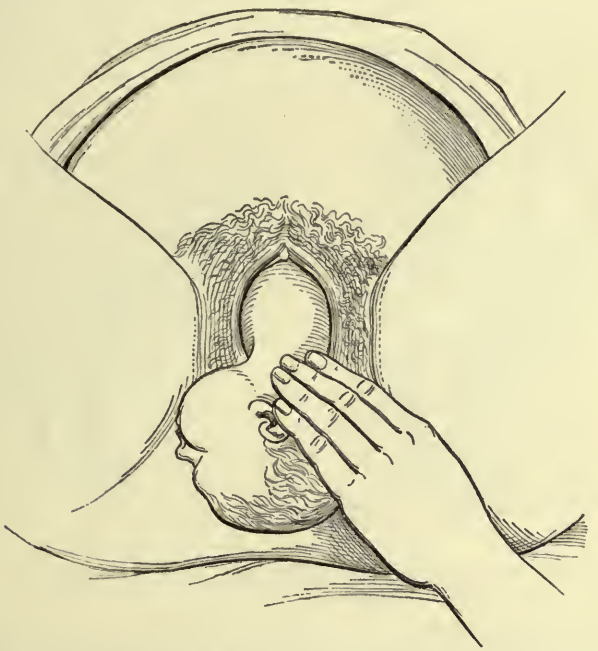

Fig. 71.—Drawing down the anterior shoulder beneath the pubes.

has just ejected. The cord should be taken between the thumb and finger to feel its pulsations and should not be tied and cut until it has ceased to beat. Observation shows that this delay gains for the child several ounces of blood. During this time the assistant should place the hand upon the uterus and make steady but gentle pressure, carrying the fundus towards the symphysis pubis.

THIRD STAGE

When the cord has been tied and cut, and the child has been removed, the patient practically enters upon the third stage of labor. Too much importance cannot be ascribed to the necessity for giving the patient a period of complete rest after the birth of the child, varying from twenty to forty minutes. The patient's head should be low, and if she feels chilly she should be warmly covered. She had better lie upon the back, and one hand should be placed upon the uterus, not making strong pressure but gently carrying the

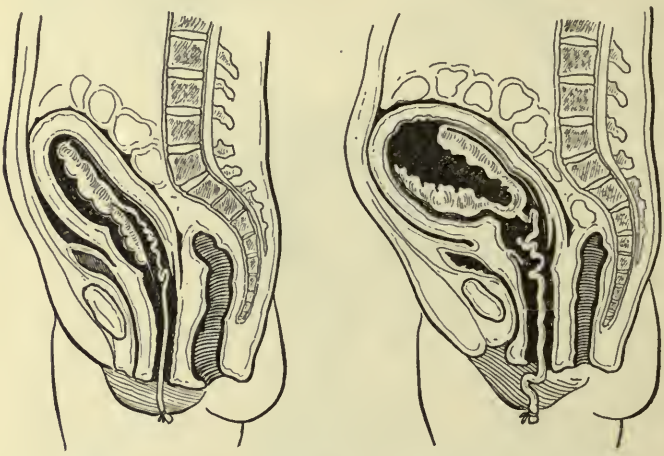

Fig. 72.—The placenta separated and forced downward.

fundus toward the symphysis pubis. The uterus will be felt to grow gradually smaller as the placenta separates and passes downward into the cervix. It may also be observed that the umbilical cord elongates. During this time many obstetricians give the patient one or two drachms of fluid extract of ergot; others give strychnia hypodermatically or by the mouth. When the patient again complains of pain the uterus should be grasped between the thumb and the four fingers placed straight behind it, carried strongly over the pubes, and pressure made downward and backward.

The patient should be asked to close the mouth and to bear down at the same time. Ordinarily the placenta will emerge in the vulva folded together. If it be grasped in the hand of the obstetrician and rotated, the membranes twisted into a cord will gradually emerge. The passage of the placenta completes labor and the patient enters upon the puerperal state. So soon as the uterus is empty stimulants should be given in proportion to the patient's need. Strychnia hypodermatically, with or without atropin and digitalin, are required if the patient shows signs of exhaustion. If the stomach is irritable, some preparation of ergot suitable for hypodermatic use may be given. The condition of the uterus should be ascertained by the hand, and the womb virtually held in the hand until firm and permanent contraction is secured.

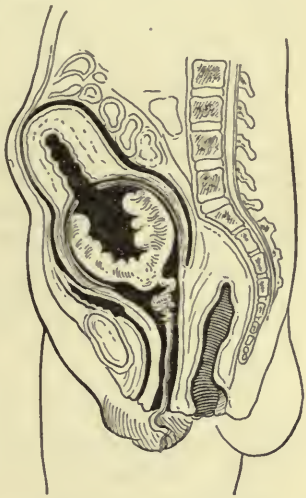

Fig. 73.—The placenta in the lower segment and cervix preceding expulsion.

Many obstetricians prefer to turn the patient across the bed to secure the expulsion of the placenta. This gives better vision and permits a more accurate examination to determine the presence or absence of lacerations. If the patient is exhausted, or the room be cold, it is best to allow her to lie upon her back and not to place her across the bed.

THE PREVENTION OF LACERATION

A moderate laceration of the genital tract is inevitable in spontaneous labor in three-fourths of all primiparous patients. In proportion as the mother's birth canal is rigid, or the tissues are deficient in firmness and normal strength, or the child's head is excessively large or firm, laceration increases in extent and severity. If the mother delivers herself, is

uncontrolled, and without anesthesia, laceration is more frequent and extensive. If the obstetrician makes improper pressure upon the pelvic floor and perineum, not allowing the soft parts to dilate, he may force the head up against the pubes and cause severe laceration of the anterior segment of the pelvic floor. The obstetrician should never deny the possibility of the occurrence of laceration, nor should he boast that he can always prevent it. Every reasonable precaution, however, should be taken, and immediate attention given to the injury whenever circumstances permit.

One of the most important factors in preventing laceration is the skilful use of ether during labor. As every precaution is to be taken, this must be given by a skilled anesthetizer. By using moderate quantities of ether well diluted with air at the moment when uterine contractions are most pronounced, and by quickly anesthetizing the patient when the head and shoulders pass, extensive lacerations may be prevented, and the number and severity of lacerations greatly lessened.

If, however, ether be administered copiously and upon the slightest complaint, the patient's labor will be unduly prolonged, uterine contractions weakened, and assistance often be made necessary.

In the conduct of labor much can be done for the comfort and encouragement of the patient by the mental attitude of the physician and nurse. While it is unwise to sympathize unduly with suffering, still the patient must be treated with every kindness and consideration and always in a hopeful and encouraging manner. As little as possible should be said and whatever possible should be done, especial care being taken to not disturb the patient if she shows a disposition to rest. It is better to have no one in the confinement room except the physician and nurse, but if the patient insists upon the presence of someone else, that person must take the cue of conduct from the medical attendant. A relative who is excited and solicitous may often considerably delay parturition and greatly interfere with the patient's medical care. It is often thought that spontaneous parturition is a perfectly natural process, requiring no especial attention, but severe laceration and injury may happen, the child's life and

that of the mother be brought suddenly in danger, while the risks of hemorrhage and infection in spontaneous labor are by no means small. Much ill-health among women arises from the neglect of spontaneous parturition, and if one would be successful in obstetric practice he must give to spontaneous labor the same thorough care and attention that he would bestow upon a surgical operation. Only such care has reduced the mortality and morbidity of spontaneous birth, which was formerly considerable.

CHAPTER XIV

THE PATHOLOGY OF LABOR

Abnormalities in the Mechanism of Labor

POSTERIOR ROTATION OF THE OCCIPUT

In spontaneous labor the anterior rotation of the occiput depends upon the normal relation between the fetus and pelvis, flexion of the fetal head, normal expulsive forces in the uterus and abdominal muscles, and the normal resisting power of the pelvic floor. If any of these factors are entirely wanting, or in several of them are deficient, the occiput may turn posteriorly. The most frequent backward turning of the occiput is toward the right, in right occipito-posterior. At the beginning of labor the head may be transversely at the pelvic brim. If the pelvis be somewhat larger than the head the latter may descend transversely through the pelvic brim and come upon the pelvic floor transversely. If flexion be not perfect the head may become firmly fixed upon the pelvic floor in a transverse position, and if the elasticity and muscular strength of the pelvic floor are lacking, the head may gradually sag backward until it stands obliquely with the occiput behind, or completely with the occiput under the promontory of the sacrum. A similar process, with reversed direction of movement, may be the case when the occiput starts with the fetal back directed toward the left side and rotates from the left posteriorly.

Diagnosis.—The diagnosis of posterior rotation of the occiput is usually made by vaginal examination. Occasionally where the mother's tissues are thin the head can be palpated in a transverse position as it enters the pelvis. As the back follows the head in rotation, palpation might detect the back as turning behind when the head rotates posteriorly in the pelvis. The heart sounds would also be heard posteriorly

unless rotation was completely behind, when they might be heard through the child's chest in nearly the usual position.

By vaginal examination, while the head stands transversely the sagittal suture is found extending transversely. At one of its extremities is the anterior and at the other the posterior fontanelle. It is rare to find both of these available to touch, but usually the posterior can be detected. As poste-

Fig. 74.—Second position, vertex presentation, from which abnormal rotation is most apt to develop.

rior rotation occurs the occiput is found to recede from the pubes and the anterior fontanelle can be made out behind the pubes. If there be considerable pressure the posterior fontanelle is obliterated and only the meeting place of three bony lines remains.

Clinical History of Labor.—In posterior rotation of the occiput labor is usually longer, more painful and more exhausting than normal. As the occiput turns behind it presses

against the pelvic floor and the coccyx and sacrum, and may press heavily upon nerve trunks at the side of the pelvis. When posterior rotation is complete exhaustion often supervenes and spontaneous labor stops. The risk to the mother arises from exhaustion, and the dangers of infection occur

Fig. 75.—Second position, vertex presentation; the vertex rotating posteriorly.

in any labor which is prolonged and in which repeated vaginal examination and instrumental delivery are practised. The child is exposed to greater danger through the risks of inspiration pneumonia and the dangers of difficult forceps extraction. Lacerations inevitably occur unless the vertex can be rotated anteriorly by artificial means.

Prophylactic Treatment.—In all cases of labor an accurate diagnosis as early as possible during labor should be made. If the occiput is transverse or is beginning to rotate posteriorly the mother should be placed upon that side toward which the back is directed. The membranes in primiparous patients should be preserved as long as possible, and in multiparous patients until dilatation is three-fourths completed.

Fig. 76.—The head impacted, the occiput posterior.

If exhaustion threatens strychnia should be given to the mother, the urinary bladder emptied frequently, and the lower bowel kept empty. If good muscular action can be procured the occiput may still rotate anteriorly without interference. In some cases flexing the thighs upon the pelvis seems to further rotation.

Active Treatment.—When the occiput shows a tendency to turn behind and the head is only in the pelvic brim, some obstetricians prefer to complete dilatation under ether and by the hand perform podalic version and delivery.

When the head has reached the pelvic cavity with beginning posterior rotation, and efforts to secure anterior turning by posture and stimulation have failed, the operator may prefer to rotate the head before it has become impacted upon the pelvic floor and then allow spontaneous expulsion to follow. To accomplish this the patient must be anesthetized with ether or chloroform, placed upon her back at the edge of a table or bed, the bladder completely emptied by catheter, and under antiseptic precautions the gloved hand should be introduced and an effort made to rotate the occiput in front of the median line of the pelvis. If the back is to the left the rotation must be on the left side anteriorly; if the back is toward the right the rotation must be on the right side anteriorly. The hand may be retained within the cervix during several uterine contractions, which may be stimulated by uterine massage. If the head can be brought to turn through two-thirds of the pelvic circumference toward the front, the forceps may then be applied obliquely to the head, and with intermittent traction the head brought down firmly upon the pelvic floor with the occiput beneath the pubes. It should be retained in that position during one or two uterine contractions when, if the operator prefers, the forceps may be removed and the head expelled by the unaided forces of labor. Many prefer, however, to compel delivery without removing the forceps or without waiting for spontaneous efforts.

If the occiput has turned completely behind and posture and stimulation have failed to secure rotation, and the effort to turn the occiput anteriorly with the hand is unsuccessful, the obstetrician must choose between delivery by forceps with the occiput behind or craniotomy. The latter is rarely required, and with suitable axis traction forceps the head can usually be delivered.

The method of such delivery consists in applying axis traction forceps accurately to the sides of the head and making intermittent tractions until the forehead of the child engages beneath the pubes. The grasp of the forceps is then

relaxed, the handles are lowered and the cephalic portions of the blades given a new grasp upon the head in such a manner as to enable the operator to lift the occiput by flexion over the pelvic floor. Considerable laceration is inevitable in such a delivery in both the anterior and posterior segments. With proper forceps, complete anesthesia and skilful manipulation, the lacerations should not extend into the bowel, but will usually complete the tear of the perineum, and lacerate in varying degree the fascias of the pelvic floor. The anterior segment will be more or less injured. In our experience, the Simpson forceps with tapes for axis traction, which are applied to the blades opposite the centre of the fetal head, are most efficient in these cases. They cause complete flexion, admit of ready change of the grasp of the instrument, and often succeed where more complicated instruments do not.

If craniotomy becomes necessary, cranioclasis should be performed, and if necessary the size of the head lessened by the cephalotribe.

PRESENTATION OF THE PARIETAL BONE

In this abnormality the head presents at the pelvic brim, flexion fails, the head turns transversely and lodges at the brim of the pelvis, strong lateral flexion of the head developing. This brings one of the parietal bones to present in the pelvic brim. The occiput and chin are strongly forced against the sides of the pelvis, the head becomes impacted, and spontaneous delivery is impossible. Disproportion between mother and child is the most frequent cause of this abnormality.

Diagnosis.—The parietal bone is not infrequently mistaken for the occiput. As the scalp over the occiput may be somewhat swollen in labor it may be difficult to recognize its sutures and fontanelle. The boss of the parietal bone may feel to the finger like the swollen occiput. Usually the sagittal or occipital sutures can be made out in occipital presentation, while in parietal presentation it is not always possible to distinguish the fronto-parietal sutures. If sufficient of the hand be introduced to palpate the head, if necessary under anesthesia, the diagnosis becomes clear.

The Clinical Course of Labor.—Spontaneous labor is impossible in this condition. Repeated contractions of the uterus and abdominal muscles force the head more firmly into the brim in its vicious position. The bladder may become enormously distended as the head may press upon the neck of the bladder and urethra. If assistance be not given the child will perish from birth pressure, and the mother be exposed to the danger of exhaustion and septic infection.

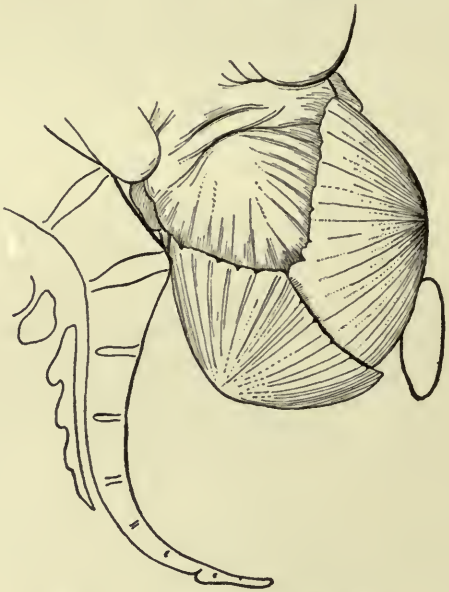

Fig. 77.—Parietal bone presentation.

Prophylactic Treatment.—The general rule to put the mother on the side toward which the back of the child is directed may be of service in preventing the development of this complication. Unless flexion be secured, good uterine contractions are of no avail but only wedge the head more tightly into the pelvic brim. Rupture of the uterus may be threatened when uterine contractions are strong and tetanic.

Active Treatment.—To save the life of the child and to spare the mother prolonged suffering and the risk of uterine

rupture or septic infection, delivery must be accomplished so soon as the vicious position is clearly made out. Where hospital facilities are available delivery by abdominal section is indicated, if the child be living and in reasonably good condition. If the patient cannot have hospital advantages she must be treated in her home. Under surgical anesthesia an attempt may be made to cautiously relax the uterus and perform internal podalic version. Should this fail craniotomy is indicated.

BROW PRESENTATION

Where instead of flexion partial extension develops, the brow or forehead of the fetus presents. This brings the

Fig. 78.—The fetal head in brow presentation.

occipito-mental or maximum diameter of the fetal head in relation with the obliques of the pelvic brim, when descent and rotation become impossible. Impaction, fetal death, and maternal exhaustion and infection may result unless artificial help be given. The causes of the condition are disproportion

between mother and child, premature escape of the amniotic liquid, and failure of flexion to develop.

Diagnosis.—By palpation the diagnosis is rarely possible except where the tissues are unusually thin. If a deep groove or depression can be made out between the occiput and the back or shoulder, it may be inferred that normal flexion is lacking. By vaginal examination the forehead can be made out, the superciliary ridges, and sometimes the orbits, and in some cases the frontal suture. The orbits and beginning of the face can often be felt and help to distinguish between brow and vertex presentation.

Prophylactic Treatment.—The retention of the membranes in primiparous patients until they rupture spontaneously, and in multiparous patients until dilatation is three-fourths advanced, is indicated. Posture is also of value, and care must be taken that the urinary bladder of the mother is emptied sufficiently often.

Active Treatment.—Under chloroform and with antiseptic precautions, if the uterus be not tightly contracted, a cautious effort may be made to convert the brow into a vertex presentation. Should this fail and the uterus relax under anesthesia, the operator may elect podalic version if he is confident that the lower uterine segment is not unduly distended. Where hospital facilities are available, and the child is in good condition, delivery by abdominal section will give the best results for mother and child. In neglected and impacted cases, with a dead fetus, craniotomy may be performed.

POSTERIOR ROTATION OF THE CHIN

When in face presentation, instead of turning to the front beneath the pubes, the chin rotates behind into the hollow of the sacrum, impaction of the head and cessation of labor result. Efforts at expulsion cause the occiput and the thickness of the fetal body at the neck to become wedged into the pelvic brim. Rotation is impossible, and if the lower uterine segment becomes greatly over-distended rupture of the uterus may result. Fetal death is a common occurrence.

Diagnosis.—The diagnosis is made by recognizing the face of the child in the centre of the pelvic cavity, the forehead in

front, the chin beneath the promontory of the sacrum and often wedged firmly upon the pelvic floor. Labor is prolonged and painful and finally ends unsuccessfully in exhaustion.

Prophylactic treatment by posture and stimulation with retention of the membranes are unquestionably of value and should be employed in all cases of abnormal presentation of the presenting part.

Active Treatment.—In these cases efforts to dislodge the chin and force it upward are exceedingly dangerous because of threatened rupture of the uterus. As the fetus is subjected to considerable pressure under unfavorable circumstances, fetal death usually happens early in labor. Craniotomy then becomes the operation of election, cranioclasis being usually employed.

TRANSVERSE POSITION OF THE HEAD

The condition which threatens serious complications for mother and child, but which is often susceptible of correction, is that of transverse position of the head at the time of engagement. This usually happens where the head is of ample proportions, but where for some reason which may not be apparent, rotation does not develop at the usual time in labor.

Diagnosis.—Before engagement examination may show the occiput to one side, the face on the other, with the sagittal suture extending transversely. The rounded occiput will be found missing and also the irregularities of the face.

Clinical History.—If the pelvis be ample, and uterine contractions are vigorous the head may descend in a transverse position to the pelvic floor. Here its anterior rotation will depend largely upon the normal resistance of the pelvic floor and the contractions of the uterine and abdominal muscles.

Prophylactic Treatment.—To secure anterior rotation, posture, stimulation, and frequent emptying of the urinary bladder and of the bowel, should all be thoroughly carried out. In the majority of cases anterior rotation develops. Where it fails patients should be anesthetized and under antiseptic precautions the gloved hand inserted and the

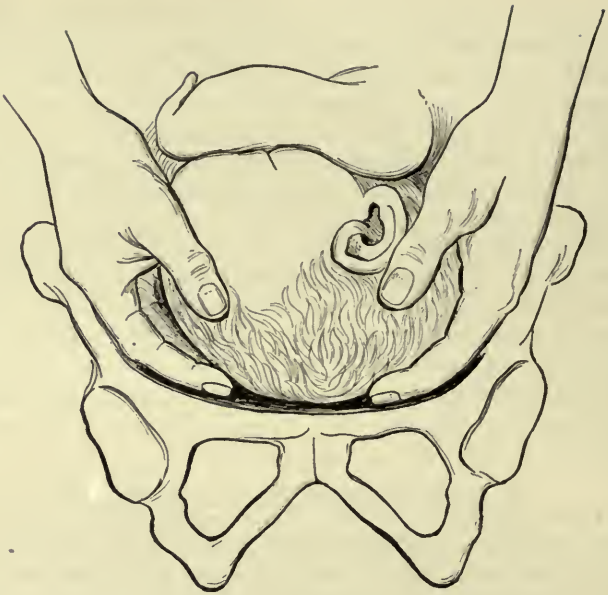

Fig. 79.—The floating head transverse at the pelvic brim.

Fig. 80.—The head in transverse position on the pelvic floor; fetus in first position (Liepmann).

effort made to turn the occiput in front. The forceps should be in readiness, so that if this effort is successful, and the occiput be turned in front of the median line of the pelvis the forceps may be applied and the head brought upon the pelvic floor with the occiput anterior. This effort is usually successful and delivery may be terminated by forceps. Should this fail and the head become impacted craniotomy may be performed. Section is rarely indicated, because until the methods for vaginal delivery are tried it may never be known that such will not be successful. Efforts to deliver through the vagina forbid the subsequent performance of Cesarean section through the danger of infection.

THE TRANSVERSE POSITION OF THE FETUS: SHOULDER PRESENTATION

This abnormality most frequently develops in labors which begin as vertex presentations, where for some reason the vertex fails to descend and lodges at the side of the pelvis, while under strong expulsive forces the trunk of the fetus is bent laterally, the shoulder presents at the pelvic brim, and the arm may prolapse through the cervix into the vagina. The most usual of these conditions is presentation of the right shoulder with the back in front, the head upon the left side of the mother, and the breech obliquely upon her right. Unless the child be very small and the pelvis very large, or the child be dead and macerated, spontaneous delivery under these circumstances is impossible. The fetus will perish from birth pressure and rupture of the uterus is especially threatening, because the lower uterine segment is distended by the head and the body of the fetus.

Diagnosis.—By palpation under favorable circumstances the head can be made out at the side of the pelvic brim, the body extending across above the pubes. Heart sounds are heard in the centre of the abdomen just above the pubes.

By vaginal examination the head is missing in the pelvic cavity. By carrying the fingers as high up as possible the axilla and the ribs can be made out, and the arm also, if prolapsed. Occasionally the fingers can be carried upon the fetal neck. To determine which arm is prolapsed it should be turned in the normal position, with the thumb upwards,

when it will correspond with one hand of the obstetrician. If it be with the right hand of the obstetrician, it is the right fetal hand, and conversely.

The Clinical Course of Labor.—This condition is especially dangerous because of threatened uterine rupture and because the prolapsed condition of the hand which often appears in the vulva, suggests to ignorant persons that the fetus should be extracted by pulling upon the arm. The result of

Fig. 81.—Transverse position of the fetus; head upon the left side.

this is to wedge the shoulders more firmly in the pelvic brim. Fetal death usually occurs early in labor through direct pressure, and often because the cord prolapses and becomes compressed between the body of the child and the side of the pelvis.

Prophylactic Treatment.—Such treatment as is best to secure proper rotation in all spontaneous labors is indicated in these cases. Where the abdomen of the mother is very

pendulous from relaxation of the abdominal muscles a broad well-fitting bandage may be applied in the last months of pregnancy, and the uterus held in the normal axis of the birth canal.

Active Treatment.—So great is the danger of uterine rupture, and so inevitable is fetal death unless help be given very promptly, that such cases should be given hospital facilities and delivered by section as soon as possible.

Fig. 82.—Transverse position of the fetus; back in front; head on the right side.

Where hospital facilities cannot be obtained an effort may be made to favor spontaneous birth by causing the woman to squat upon the pelvic floor in such a posture that the leg of the mother on the side toward which the head is lying should be strongly flexed, rotated slightly inward, and made to press firmly across the head. The patient should lean forward, the left leg being more strongly flexed and the patient

in the squatting posture. The result of this posture and pressure has been in some cases to cause the dislodging of the head from its fixed position, followed by strong lateral flexion of the trunk and the engagement and descent of the breech. While this is unsuccessful in most cases it is by no means im-

Fig. 83.—Transverse position of the fetus; shoulder presentation with impaction (after Liepmann).

possible, but cannot supersede operative treatment, if the latter can be obtained.

If rupture of the membranes is promptly followed by the development of shoulder presentation with prolapse of the arm, and possibly of the umbilical cord, under complete anesthesia and with antiseptic precautions, the operator may endeavor to replace the cord and carry it above the pelvic

brim. He may then terminate labor by podalic version. This procedure becomes exceedingly dangerous if the lower uterine segment is greatly distended, when uterine rupture often follows. Where hospital facilities are available and the child is living and in good condition, delivery by abdominal section will give the best results for mother and child.

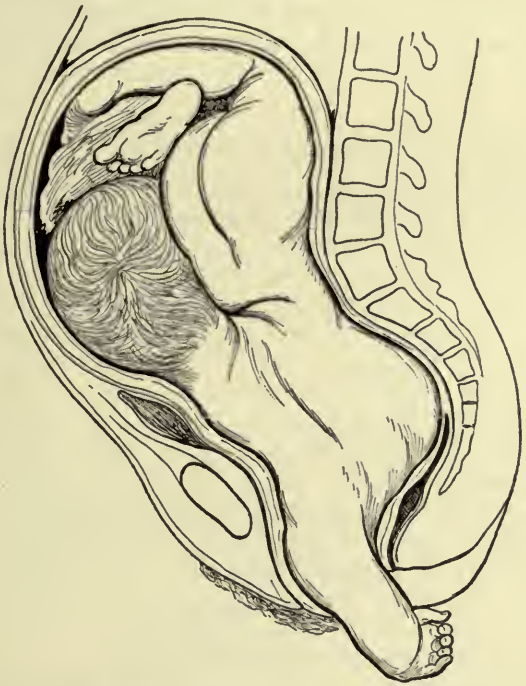

Fig. 84.—Shoulder presentation with impaction, and prolapse of the arm with threatened uterine rupture.

In neglected cases where the child is dead when the patient is seen and where uterine rupture threatens, the fetus must be removed by embryotomy or section. The fetal body and the prolapsed arm and shoulder form a wedge, the broad end of which is impacted in the pelvic brim while the narrow edge is presenting. To discompose this wedge the

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operator must grasp the arm and pull it gently but strongly downward and then with long blunt-pointed stout scissors amputate the shoulder and remove the arm. This lessens the bulk of the presenting tissues sufficiently to permit the safe performance of podalic version. Others prefer to perform decapitation by the hook or loop. After this the limbs of the child are seized, the body is extracted, and afterward forceps applied to the head, delivery being effected in that manner. In these cases a careful examination of the uterus should be made after delivery to detect if possible its rupture.

IMPACTION OF TWINS

Where twins are present, one in breech presentation, the other in head presentation, impaction cannot develop in the first portion of labor; but if the child first born is dead in breech presentation, the aftercoming head may become wedged with the head of the other twin, so that the occiput of one is beneath the chin of the other. This will result in bringing both heads at the brim of the pelvis in such position that descent and delivery will be impossible. Fetal death soon occurs, the lower uterine segment becomes greatly distended, and the mother is exposed to the dangers of rupture.

Diagnosis.—When one twin is born as far as the shoulders and there is delay in expulsion of the head, a careful examination should be made to ascertain the cause. In all cases of twin delivery care must be taken in extracting the first twin if it presents by the breech so that impaction may not develop.

Active Treatment.—Embryotomy is the only form of treatment indicated, unless in neglected cases where the mother was infected on admission to hospital, in which case it might be safer to deliver her by the Porro operation. The removal of the body of the uterus and the fixation of the stump outside the peritoneal cavity, should save her from septic infection. If abdominal section be not performed the head of the twin first presenting should be severed by cutting through the neck, and the presenting part of the body of the first twin should be removed. Under complete anesthesia the uterus should be relaxed as much as possible, the severed

head pushed upward into the uterus, and the remaining twin extracted by forceps or version. The severed head may then be brought by pressure to the pelvic brim and made to descend into the pelvic cavity, whence it can be extracted by forceps.

POSTERIOR ROTATION OF THE TRUNK

In breech presentation and in abnormal rotation in other presentations the back of the child may rotate posteriorly.

Fig. 85.—Breech presentation, first position; extraction of the breech by introducing the fingers into the groins.

If the breech comes first this will bring the occiput of the child behind at the moment of birth. Should the chin then become extended and lodge behind the symphysis, the head may become impacted and the child be lost through birth pressure.

Fig. 86.—The hips passing over the pelvic floor.

Fig. 87.—Delivering the limbs in breech presentation as the breech emerges.

Fig. 88.—Bringing down the arms by traction upon the child's pelvis.

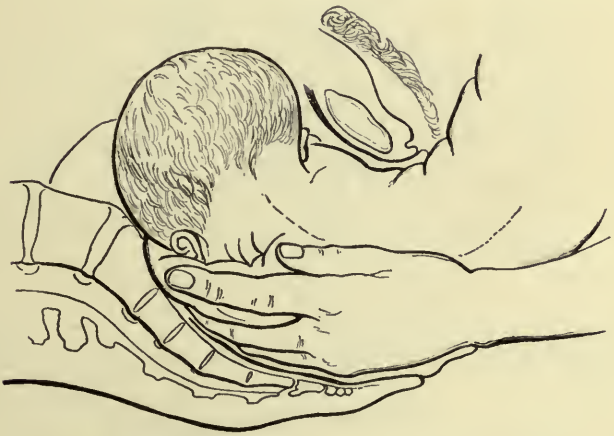

Fig. 89.—Bringing down the posterior arm.

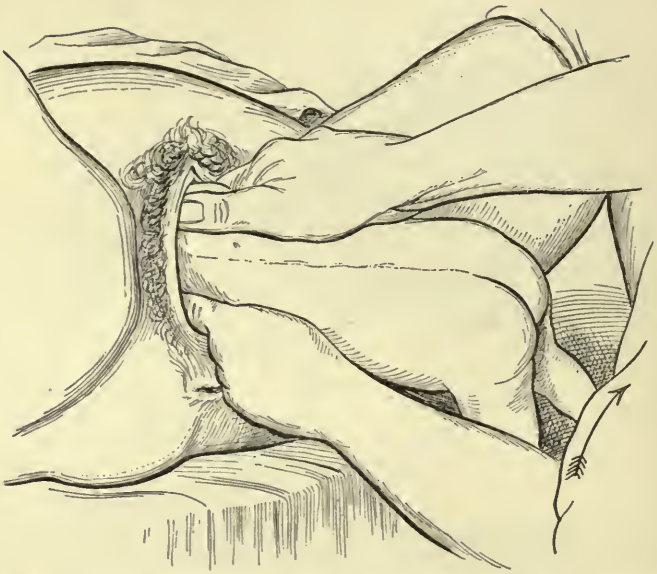

Fig. 90.—Breech presentation; the posterior arm delivered. Bringing down the anterior arm.

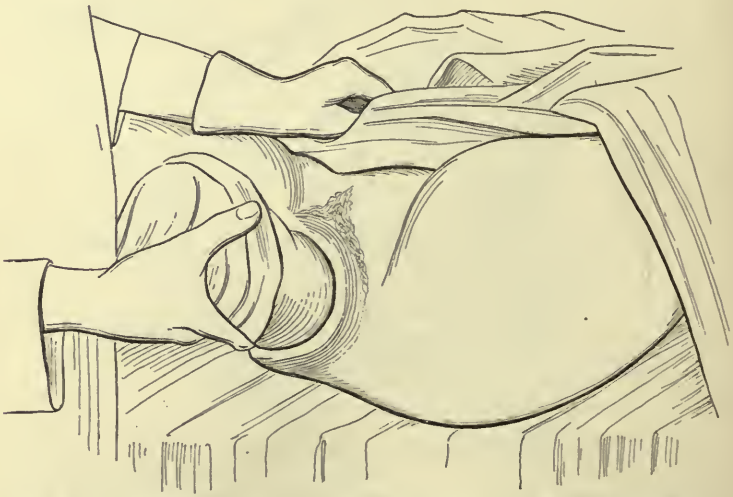

Fig. 91.—Raising the child's body wrapped in a towel, and pressing strongly downward and backward behind the pubes upon the occiput.

Prophylactic Treatment.—Posterior rotation of the back should always be kept in mind in delivering breech cases. So soon as the operator can control the limbs of the fetus

Fig. 92.—Breech presentation. Delivering the head when the occiput turns posteriorly.

the pelvis should be rotated anteriorly in accordance with the original position of the back on the left or right side. If care be taken to carry out this simple procedure as the body

is extracted the back can be turned in front and the occiput brought under the pelvic arch.

Active Treatment.—Where, however, the case is not seen until the body of the child is expelled with the back posterior, the patient must be placed at the extreme edge of the bed or table, and the body of the child allowed to hang downward.

Fig. 93.—Delivery of the head, the vertex anterior.

The fingers of the operator may then be placed in the child's mouth, the body and head rotated in the oblique diameter of the pelvis, and by traction upon the mouth the chin dislodged and the face brought down in the anterior extremity of the oblique diameter. If the forehead can be made to lodge behind the pubes the child's body may then be strongly

raised and the occiput delivered over the pelvic floor by strong flexion of the head. Should this procedure fail it is sometimes necessary to apply forceps or do craniotomy on the after-coming head in these cases.

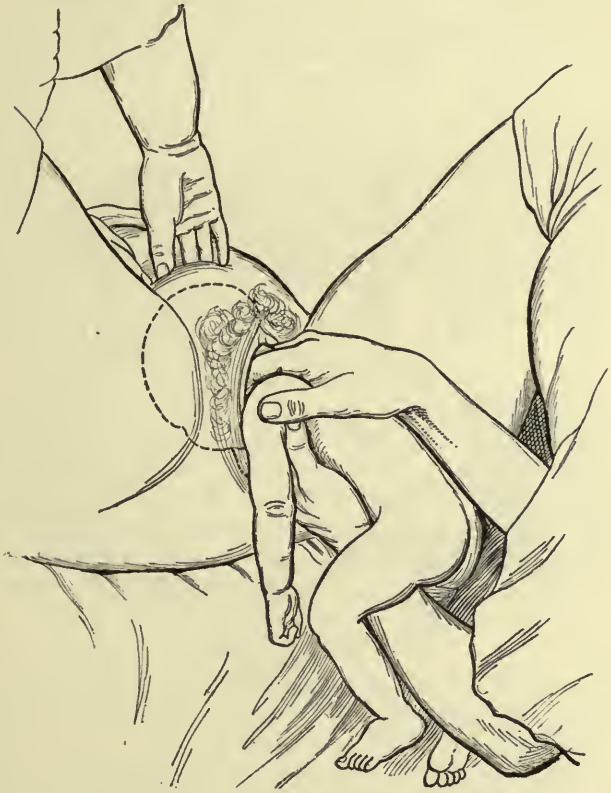

Fig. 94.—The birth of the after-coming head aided by pressure beneath the pubes.

POSTERIOR ROTATION OF THE TRUNK IN HEAD PRESENTATION

In head presentation the shoulders and trunk naturally follow the rotation of the presenting portion of the head.

Persistent posterior rotation of the trunk is sometimes a serious complication in endeavoring to rectify posterior rotation of the head. This usually occurs where the amniotic liquid has completely escaped, and the body of the child is

Fig. 95.—The extraction of the head in flexion.

firmly grasped in the tetanic contraction of the uterine muscle. If the uterus be relaxed as completely as possible with chloroform it is usually possible to rotate the shoulders and trunk through the oblique diameter and thus to deliver.

IMPACTION OF THE SHOULDERS

In various presentations and positions the shoulders may become impacted across the pelvic brim during labor. This usually arises from disproportion, the child being too large for the mother. In these cases the simplest method for lessening the breadth of the fetal shoulders is to cut one or both clavicles—the procedure known as cleidotomy. This may be done with strong blunt scissors, the fingers of one hand guarding the mother's tissues while the other hand uses the instrument. Severing the clavicles causes the shoulders to collapse and gradually lessens the bisacromial diameter.

Posterior rotation of the trunk may often be inferred from heart sounds. As the back recedes the heart sounds may at first becomes less distinct, and finally are recognized more clearly as the child's chest is turned toward the mother's anterior abdominal wall.

PROLONGED LABOR

No time limit can be placed upon labor. In patients who are not of a nervous temperament the first stage of labor may last for several days, and still successful spontaneous birth occur. Labor is prolonged when its duration exceeds the physiological endurance of the patient, or when there is some condition present like contracted pelvis, which makes spontaneous labor impossible.

UTERINE INERTIA

This most frequent cause of prolonged labor, when disproportion is absent, may arise from several causes. The most common is undue sensitiveness to the pain caused by uterine contraction. This is most often seen in badly nourished, ill-developed, neurotic primiparæ, or in multiparæ who have become so depleted that uterine neuralgia is present. Toxemia is a not infrequent cause of deficient muscular and nervous force in labor. The uterine muscle, like any other, may become exhausted in labor, when uterine contractions will cease from inertia. In some patients a pathological condition of the uterine muscle, as multiple small fibromata, may make normal uterine action impossible.

Rigidity of the Soft Parts.—When the genital tract is poorly developed or the cervix unusually long and resisting, or the patient a primipara considerably over the average age of childbirth, labor may be greatly prolonged because a rigid cervix dilates slowly, and the rigid perineum and pelvic floor do not relax to permit the expulsion of the child. In some cases spasmodic contraction of the cervix and spasmodic rigidity of the pelvic floor delay labor through increased nervous irritation. In multiparæ where the cervix has been repeatedly torn, and infection may have resulted, the cervix may be so filled with scar tissue that it dilates very slowly and imperfectly, and thus delays labor. In patients where the normal secretion of the cervix and vagina is absent muscular rigidity results with delay.

Nervous Exhaustion.—This very important factor in prolonged labor cannot be accurately assigned to any distinct anatomical cause. It is seen in patients ill-nourished and in whom the nervous system is badly developed, highly sensitive and excitable. Such patients commonly demand anesthetics or anodines, the uterine muscle becomes easily fatigued, and after delivery they are liable to severe nervous collapse or shock.

Diagnosis.—The diagnosis of uterine inertia, rigidity of the soft parts, and nervous exhaustion complicating labor, is most important. The obstetrician must first satisfy himself that the pelvis and the child are proportionate in size, and that he is not dealing with contracted pelvis or an excessively large child, or hydrocephalus, or monstrosity. He must next determine accurately that the presentation and position are favorable for spontaneous birth. It is obvious that a patient must become nervously exhausted in labor and suffer uterine inertia if the fetus be in transverse position shoulder presentation, and spontaneous birth be impossible.

Face presentation, brow presentation, parietal bone presentation, and abnormal rotation of the presenting part complicating labor, are frequent causes for uterine inertia and nervous exhaustion. One of these may be suspected when a patient with normal pelvis and fetus enters labor and does not go on naturally. Premature rupture of the membranes and

the escape of the amniotic liquid before dilatation is at least half completed is a frequent cause of nervous exhaustion.

To make an accurate diagnosis a thorough anatomical examination must first be made. The condition of the bladder and the rectum must also be ascertained, for a full bladder may occasion such distress as to interfere with labor, and if the rectum be full of hardened feces the descent of the child may be delayed. If no anatomical cause can be found for delay the vital condition of the patient must next be ascertained. If her pulse be good, her temperature normal, the surface of the body normal, the membranes unruptured, the fetus in normal position and presentation, and the bladder and rectum of the patient emptied, the cessation of labor pains for a short time should give no anxiety. So far as uterine inertia and nervous exhaustion are concerned, the important clinical fact must be borne in mind that except in the case of Cesarean section it is unwise to empty the uterus by vaginal delivery unless the uterus is contracting. Serious relaxation and post-partum hemorrhage with shock, may follow unless this precaution is observed.

Treatment.—Where uterine inertia only is present the bladder of the patient should be emptied thoroughly by catheter and the lower bowel by a copious warm injection. The temperature of the patient's room should be made as comfortable as possible and she should be put at absolute rest, with the hope that natural sleep may result. If her pains are nagging and irritating and exhausting, morphia with atropin should be given hypodermatically. If the patient shows signs of exhaustion a moderate quantity of alcoholic stimulant with the morphin and atropin will be of value. Rest and sleep usually follow, and labor will begin with renewed activity when the patient has rested.

Where the uterus is evidently exhausted and the patient threatened with nervous exhaustion, the treatment by morphia, atropin and alcohol, is useful until rest has been procured. When the patient again becomes wakeful she will require a stimulant to uterine contractions. For this purpose at present we have two valuable remedies which should be given hypodermatically; one is strychnia, the sulphate or phosphate, the dose being from $\frac{1}{60}$ to $\frac{1}{20}$. The effect of

strychnia is often increased if the patient takes by mouth 30 drops of brandy and 30 drops of aromatic spirits of ammonia. Pituitrin is also of value for uterine inertia and should be given hypodermatically deeply into the muscles, in doses of from 1 to 1.5 c.c. It should, however, be especially borne in mind that pituitrin must not be given until the cervix is two-thirds dilated and the conditions favorable for vigorous uterine action and prompt expulsion of the child. Pituitrin causes rapid and vigorous uterine contractions, and where it has been given before dilatation was sufficiently advanced dangerous tears of the cervix, and in some cases rupture of the uterus, have resulted. In multiparous patients with two-thirds dilatation of the cervix, and the membranes present, if the conditions are favorable for labor, rupture of the membranes will usually be followed by increased uterine action. When patients are threatened with nervous exhaustion digitalin may be given with strychnia hypodermatically with advantage.

For uterine inertia and nervous exhaustion in labor, quinin, alcohol in large doses, and ergot, have all been used. Quinin is unreliable, ergot produces tetanic action of the uterus and frequently destroys the fetus, and large doses of alcohol are sedative and not stimulating. None of these drugs can be recommended. Where it has been necessary to stimulate the patient for uterine inertia or nervous exhaustion during labor, especial care must be taken to guard against shock after delivery. Strychnia hypodermatically should be repeated so soon as the uterus is empty, and ergot may then be given hypodermatically freely, and with good results.

Rigidity of the soft parts delaying labor may be treated by artificial dilatation with silk or rubber dilating bags. Among these the French bag of Champetier de Ribes, and those devised by Voorhees and Pomeroy, are especially useful. The de Ribes bag is inelastic, made of silk, and covered with impervious material. The Voorhees bag is of rubber: the Pomeroy bag is double, containing a portion which goes within the cervix and another portion which dilates the vagina. To introduce this, if the patient be sensitive, partial anesthesia may be necessary. The bladder and rectum having been emptied under anesthesia, the patient is placed across

the bed or upon a table, a gentle irrigation of 1 per cent. lysol is given, and the gloved fingers of the left hand introduced beneath the cervix. The bag folded in forceps is introduced under the guidance of the fingers and passed within the internal os. An assistant then fills the bag with normal salt solution or 1 per cent. lysol, with a piston syringe, until the pressure of the fluid in the bag forces the piston of the syringe outward. A clamp is then placed upon the tube of the bag. The vagina should be moderately tamponed with 10 per cent. iodoform or sterile gauze. The tube of the bag is carried upward above the pubes and maintained in place by a binder or bandage.

Before inserting the bags they should be thoroughly tested to see that they do not leak and that they are sound. Some prefer to attach a weight to the tube of the bag and thus to make constant traction until the patient expels the bag spontaneously. As the parts dilate more fluid may be forced into the bag until its capacity has been reached.

The disadvantages in the use of bags are the pain which they cause, which is often severe and sometimes intolerable. Bags have displaced a low attached placenta and given rise to hemorrhage. The bursting of a bag has caused fluid or air to enter the uterine sinuses. Dilating bags sometimes displace the presenting part, and change a favorable into an unfavorable mechanism. In cases where the cervix is filled with scar tissue bags are not strong enough to dilate the parts adequately.

The advantages of bags are the fact that they can readily be used in private houses, that they do not require incision for their introduction, and that in some degree they imitate the pressure of a firm and full bag of waters.

If bags be employed successfully the presence of the bag will not only dilate the soft parts but stimulate uterine contractions. When dilatation is complete the bags may be removed and the patient allowed to deliver herself, or if necessary some vaginal operation may be done. In using bags, if the membranes are unruptured, care should be taken not to rupture them, and if the membranes have been ruptured when the bag was introduced, when it is removed an examination should be made to see that a loop of cord has not

prolapsed. This sometimes follows the removal of a dilating bag.

Where haste is necessary because the patient is in a critical condition, and the soft parts are rigid and undilatable, the birth canal must be opened by incision. If the cervix only seems to be resisting it may be incised by four cuts extending obliquely above and below. To avoid the uterine arteries the lateral surfaces of the cervix should not be incised. Incision of the cervix has given place among modern operators to vaginal Cesarean section, which will be described under obstetric operations.

Some operators prefer to dilate a rigid cervix or pelvic floor by the gloved hand. This is only possible when the cervix has practically become obliterated in primiparæ, or when it is not unduly hard and resisting in multiparæ. In doing this the writer prefers to introduce the longest finger of each hand and to move the hands through each half of the circle, adding other fingers as the cervix dilates, until four fingers of each hand can be introduced at full dilatation. No effort should be made to force the fist through the cervix until it is completely dilated, for such an effort might cause rupture of the uterus. Others prefer to introduce one finger, sweeping it about the cervix, then other fingers, until four are used for dilatation. This maneuver requires experience, dexterity and strength, and is, unfortunately, inefficient in those cases which are most serious and where the cervix must be opened most efficiently and promptly.

To dilate the vagina and pelvic floor the gloved hand is especially valuable. Here the hand introduced may be gradually closed into the fist, and rotated gently, until the vagina and pelvic floor have been thoroughly dilated.

In cases where dilatation is almost complete and it is necessary to apply forceps, the fingers should be used to secure as complete dilatation as possible before the instrument is applied. Under ether this should be an invariable procedure.

Rigidity of the soft parts can to some extent be influenced by repeated hot irrigations with antiseptic fluid, of which lysol 1 per cent. is best. This has the disadvantage that it is uncertain and tedious, that it washes away the natural

secretion which lubricates the birth canal, and exposes the patient to additional risk of infection.

DISPROPORTION CAUSING PROLONGED LABOR

When pelvis and child are disproportionate, but the difference in size is not so great as to make spontaneous labor impossible, birth may be greatly prolonged. To secure delivery

Fig. 96.—Disproportion between mother and child; the mother with rhachitic pelvis (after Liepmann).

in these cases the fetal skull must be compressed to the utmost and the head excessively molded and elongated. Such a head is often called "wire-drawn." This process consumes considerable time and increases very much the difficulty of labor. Abnormalities in the shape of the fetal cranium may also prolong labor and delay rotation of the presenting part. An excessively hard fetal head may mould with great difficulty and greatly prolong gestation.

Diagnosis.—The diagnosis of disproportion between mother and child should be begun with the measurement of the mother's pelvis. When this is decisive, it will give the obstetrician valuable information. The positive diagnosis of disproportion is made by accurate vaginal examination and by accurate and painstaking observation of the progress of labor. When the head enters the pelvic brim only, and after ample time does not mould properly and descend, the position of the fetus being normal and good uterine contractions being present, disproportion may be recognized. When in spite of favorable conditions the head remains movable above the pelvic brim, and by combined examination is evidently large, disproportion is present.

The diagnosis of this condition is one of the most important with which the obstetrician has to do. A mistake in this diagnosis would lead to a mistake in treatment which may cause the life of the child, or both mother and child.

The diagnosis must be made by palpation, auscultation, pelvimetry, and palpation of the head and pelvis. The urinary bladder of the patient must first be completely emptied, and if there be any doubt of this the catheter should be employed. If the patient is sensitive and threatened with exhaustion, partial anesthesia may be of great value. By palpation the obstetrician will find that the head is in the pelvic brim, but not descended and engaged. This is often a difficult point to recognize by palpation, but it must be remembered that the head is still in the pelvic brim until it is virtually within the pelvic cavity and below the promontory of the sacrum. In extreme disproportion the diagnosis is comparatively easy because the head in these cases does not even enter the pelvic brim.

By vaginal palpation the obstetrician must first rule out presentation of the parietal bone or brow presentation. He must then locate the spines of the ischia and determine the position of the head with relation to these landmarks. By gentle pressure he can ascertain whether the head is movable or whether it is firmly fixed in the pelvis. The position and presentation should be accurately made out, and the situation of the head with relation to the pelvis. While it is easy to palpate the head if the membranes are ruptured, it is not

impossible before the amniotic liquid escapes, and the presence of the membranes should not prevent the natural engagement and descent of the presenting part.

In multiparous patients in whom engagement and descent do not develop at the beginning of labor, it may be difficult to accurately ascertain the comparative size of the mother and child. Here combined examination is valuable, and pelvimetry and the history of previous labors must not be neglected.

Treatment.—Many obstetric disasters arise in cases of disproportion, and in no condition is it more important to make a correct choice of the method of treatment.

It is absolutely necessary for the successful management of such a case that the obstetrician ascertains clearly whether engagement is or is not present. Having learned that the size of the mother's pelvis is such that spontaneous birth is possible, and sufficient time for uterine action having elapsed to secure engagement, if this be not present it is a strong indication that disproportion is present. So important is this decision that partial anesthesia should be used, if it cannot be made without it. If the head be well engaged, with at least three-fourths its bulk in the pelvic cavity, the obstetrician must next determine if possible whether the head is unusually ossified. This may be inferred by examining the sutures and fontanelles, when, if ossification is unusually advanced, the fontanelle will be smaller than normal and the sutures completely or partially closed. Palpation should also determine the presence or absence of moulding of the head. If engagement is well advanced and moulding is present, and the patient's general condition indicates that delivery is necessary, the obstetrician must ascertain the vital condition of the child. This may be inferred from the frequency and character of the heart sounds. Rapid feeble heart sounds, or slow and feeble heart sounds, are alike unfavorable. The entire absence of heart sounds indicates fetal death.

Should the fetus be dead and disproportion present, delivery should be effected by craniotomy, in the interests of the mother. If, however, the fetus be living and in fair condition, with favorable position and presentation, engagement and at least partial descent, and delivery required

in the interests of mother and child, the forceps should be chosen.

With the child living and in good condition, and moderate disproportion present, it may be possible to enlarge the mother's pelvis and thus permit vaginal delivery. This may be done by pubiotomy or symphysiotomy.

Where mother and child are disproportionate, if vaginal delivery be possible, the fetus may undergo severe birth-pressure and may be born partially asphyxiated. Additional care will be necessary for the child for some time after its birth.

Where disproportion is present and engagement and descent do not develop after the mother's general condition has received attention, and reasonable time has elapsed, delivery must be effected by a major operation—abdominal Cesarean section, pubiotomy or symphysiotomy.

IMPACTION OF THE FETUS

When position and presentation are such that normal mechanism becomes impossible, strong uterine and abdominal contractions may force the fetus into the pelvic brim, causing impaction. Where the presenting part rotates abnormally a similar condition may develop; thus posterior rotation of the chin, shoulder presentation transverse position, with prolapse of the arm, result in impaction unless artificial aid be given. The results of impaction are the death of the child and the death of the mother from infection, rupture of the uterus, or exhaustion.

Diagnosis.—In shoulder presentation transverse position, the diagnosis of impaction is made by recognizing the protruding arm, by palpating the abdomen with the urinary bladder of the patient empty, and by vaginal examination. Where impaction develops when the head presents, abdominal palpation gives less information, and a positive diagnosis must be made by careful vaginal palpation. If the patient has been long in labor and the vagina, pelvic floor and perineum are swollen, an exact diagnosis of the position of the impacted head may be impossible. But the clinical history, the physical state of the mother, the cessation of the natural

phenomena of labor, with the vaginal examination, should make diagnosis possible.

Treatment.—In most of these cases the life of the child is lost or must inevitably be sacrificed. The obstetrician need pay but little heed to the fetus. In attempting to relieve the mother he must first ascertain accurately the condition of the uterine muscle. If it be in tetanic contraction, if the contraction ring be present and the lower segment be greatly distended, uterine rupture is threatened. His efforts to remove the impacted fetus may precipitate this accident. In such a case the bulk of the fetus must be lessened before an attempt is made to deliver it through the vagina. If the head presents craniotomy should be done; if the shoulder presents the wedge must be decomposed by amputating the arm at the shoulder, or by decapitation. If the patient be long in labor with shoulder presentation, and be infected, abdominal section with the removal of the greater part of the uterus, is indicated.

Where impaction is present it may be necessary to use anesthesia to make a complete diagnosis and to carry out any manipulation which is supposed to improve the condition of mother or child.

RUPTURE OF THE UTERUS

This most dangerous accident is followed by the complete cessation of labor, and if the mother receives no aid she will die of peritonitis or exhaustion.

Etiology.—Rupture of the uterus usually occurs from abnormal mechanism in labor or disproportion which results in impaction. The lower uterine segment becomes over-distended and greatly thinned by the presenting part, the upper portion of the uterus is in tetanic contraction, and the lower border of the expulsive segment can be plainly made out as a ridge extending transversely across the uterus above the pubes. Rupture usually occurs transversely upon the anterior surface at the junction of the lower and upper uterine segments; less often the posterior portion is torn; very rarely both anterior and posterior surfaces are ruptured. The early escape of the amniotic liquid predisposes to rupture. In ill-developed primiparæ where the uterus is anatomically defi-

cient, rupture may occur; while multiparæ who have borne children rapidly, and under bad conditions, may develop changes in the uterine muscle which readily permit rupture. So rupture of the uterus has occurred in spontaneous labor

Fig. 97.—The most usual rupture of the uterus, transversely across the anterior wall. The contraction ring markedly developed.

when apparently normal progress was going on. It has occurred without excessive uterine contractions and for no apparent cause. In these cases, however, when the uterine muscle was subjected to microscopic examination its fibres

were found degenerated and many of them replaced by connective tissue.

Signs and Symptoms.—The signs and symptoms of uterine rupture are sudden and often excruciating pain in the abdomen, and the immediate and complete cessation of uterine contractions. Fetal movements cease and the fetal heart sounds very soon disappear. There may be some escape of blood from the vagina, but in many cases this is absent. The patient complains of great pain, there is shock with rapid feeble pulse and subnormal temperature, followed by gradual development of septic infection, fever, peritonitis, and death.

Rupture of the uterus is rarely confused with other serious conditions. In the early months of pregnancy rupture of an ectopic gestation may be present.

Diagnosis.—The diagnosis of rupture of the uterus is made by the signs and symptoms, by the immediate cessation of progress in labor, the fetus often receding into the pelvic or abdominal cavity so that it cannot be felt on vaginal examination.

The signs of fetal death are a valuable indication. Tenderness in the abdomen which rapidly increases, evidences of shock and infection, and in some cases the palpation of the fetus in the abdomen instead of in the uterus, complete the diagnosis. On vaginal examination the fingers may often be passed through the rent in the uterine muscle. Sometimes a loop of intestine prolapses through this aperture.

Treatment.—This condition is so uniformly fatal that no delay should be permitted in instituting prompt treatment.

If possible, the patient should be immediately transported to hospital. If shock be severe, morphin and atropin with digitalin should be given hypodermatically. If there be much hemorrhage, compression of the aorta by a pad and bandage, or by what is termed Momburg's bandage, may be employed until the patient can be brought into hospital.

So soon as possible under antiseptic precautions a thorough examination should be made. If the head is on the pelvic floor or in the pelvic cavity the patient should be as thoroughly anesthetized as her condition permits and the fetus extracted in the gentlest manner possible. So soon as this is done the gloved hand should follow the umbilical cord

into the uterus and ascertain the position and size of the rent. The placenta should be removed with the membranes and blood clot, but no irrigation should be practised. If the rent be of moderate size only and if there be not much hemorrhage, and the patient cannot be taken to hospital, an effort may be made to save the uterus and the patient's life as well. To accomplish this, under antiseptic precautions as thoroughly as possible, a broad strip of 10 per cent. iodoform gauze should be carried into the uterus wfth the fingers of the gloved hand and passed through the rent in the uterus to serve as a drain. Sufficient gauze should be used to pass well beyond the uterus and to distend the uterine body with moderate firmness. This gauze should be brought out at the cervix and the vagina tamponed with bichloride gauze. Strychnia should be given hypodermatically, care should be taken to have the patient catheterized at frequent intervals, dry ice bags and turpentine stupes should be placed over the abdomen, and the patient given morphin and atropin, and strychnia and digitalin hypodermatically. If such a case be promptly treated under antiseptic precautions a considerable proportion are saved. The child is almost universally lost.

While the procedure just described is permissible when hospital facilities cannot be obtained, in hospital all cases of uterine rupture demand immediate abdominal section. In severe cases the fetus is found in the abdominal cavity and sometimes the placenta as well. A varying quantity of blood is also present.

The operator must first remove the child and its appendages and then carefully examine the uterus. An operator of experience may try to save the uterus if the rent be not very large and does not extend into the broad ligament. To do this the uterus should be tamponed with iodoform gauze and the gauze brought through the cervix into the vagina. If the uterine wound is ragged it should be trimmed by scissors and the wound closed with buried stitches of silk, extending through the muscle only. The peritoneal covering should be brought together by continuous catgut stitches. The uterus should be placed in normal position and a gauze drain passed to the bottom of the pelvis behind the uterus through the lower end of the abdominal incision.

During operation the patient should receive intravenous saline transfusion, and the stomach should be thoroughly irrigated with hot salt solution before the patient leaves the table. Where the patient is robust and is brought promptly to hospital, and has not had great hemorrhage, and where the rent is favorably situated for union, this procedure may be successful.

In the majority of cases the uterus is torn so extensively through its lower segment and into the broad ligament that suture is unsafe. Hysterectomy must be performed, leaving one or both ovaries and removing the Fallopian tubes. Many obstetricians prefer to extirpate the uterus rather than to leave the cervix, through fear of infection. Whether the uterus be extirpated or hysterectomy done, the pelvis should be drained by gauze either through the vagina or through the lower end of the abdominal incision. If the patient's condition permits, the edges of the broad ligament should be brought together by continuous catgut and the pelvic fascia as well. The patient will require free stimulation, as there is usually pronounced shock where rupture is extensive.

Mortality.—It cannot be too strongly urged that the patient's best chance for recovery in this otherwise fatal accident lies in immediate operation. Under favorable circumstances the mortality may be reduced to 10 to 20 per cent. Under ordinary circumstances a mortality of from 60 to 90 per cent. is not unusual. The recovery of the child after rupture of the uterus is a very rare occurrence.

The Prevention of this Accident.—As many cases of uterine rupture occur in the practice of incompetent persons, and are clearly preventable, this serious condition should be prevented by restricting the care of obstetric cases to competent persons, ruling out ignorant midwives and practitioners, and by educating the profession and the laity to recognize the necessity for prompt hospital care. To prevent this accident students must be thoroughly instructed in recognizing the absence of engagement and descent, the presence of impaction of the fetus, and the presence of the contraction ring and distended lower segment. The student and general practitioner must realize under these conditions that the patient must be brought to hospital as quickly as possible, and without interference.

PROLAPSE OF THE CORD OR FETAL PARTS

Prolapse of the umbilical cord may result where the child is considerably smaller than the mother's birth canal, where the membranes rupture followed by a sudden discharge of a large quantity of fluid, or where the fetus becomes impacted

Fig. 98.—Prolapse of the cord and hand (after Liepmann).

in shoulder presentation transverse position. An unusually long cord which is not coiled about the child favors prolapse.

Diagnosis.—Prolapse rarely happens before rupture of the membranes. Occasionally a loop of cord descends into the membranes if the head be much smaller than the pelvis. The cord is usually recognized without difficulty and it

should at once be ascertained whether it still pulsates or whether pulsation is diminished or has ceased.

This accident results in danger to the fetus through compression of the cord between the child and the pelvis, leading to gradual asphyxia. Where this occurs the child's movements become at first more rapid and violent than normal, and finally subside. The danger to the mother is secondary because of the abnormal conditions which make interference necessary.

Treatment.—The obstetrician must keep in mind the possibility of prolapse of the cord in transverse positions

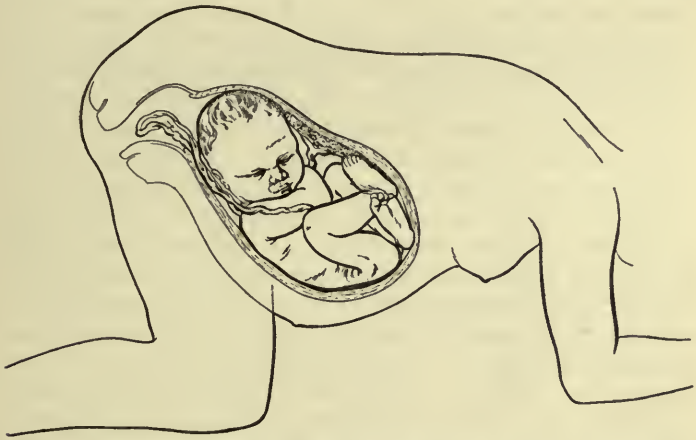

Fig. 99.—Prolapse of the cord partly replaced by the knee-chest position (after Liepmann).

before the membranes rupture, and in cases where it is necessary to use dilating bags, and where the removal of the bag is sometimes followed by prolapse of the cord.

When this occurs a choice must be made between two methods of treatment.

Where the presenting part is not in the pelvic cavity and the genital tract of the mother is dilated and dilatable, the patient should be anesthetized, and under antiseptic precautions the obstetrician should take the prolapsed cord gently in his thumb and fingers, and introducing the hand

carry the cord above the pelvic brim. Anesthesia should then be stopped and the uterus allowed to contract, when the fetus may descend and prevent the return of the cord. If when the hand is introduced with the cord the uterus is not found in tetanic contraction and the fetus freely movable, some operators prefer to perform internal podalic version, which prevents the further prolapse of the cord. Some prefer the use of a repositor in place of the hand, but these instruments are not as reliable as the hand and do not give the operator the same information. Cord repositors consist of flexible hollow tubes having a loop of cord emerging from an aperture just above the tip of the tube. This loop of cord is passed around the umbilical cord and the loop then placed over the tip of the repositor. It is drawn sufficiently tight to hold the cord in position and the instrument is then passed with the cord into the uterus as high up as possible, the grasp of the instrument and cord relaxed, and the instrument pulled gently outward, when the cord slips over the tip and the umbilical cord is freed within the uterine cavity. An ordinary flexible good-sized catheter may be used as a repositor in this way. Other repositors are constructed upon practically this principle, some of them containing a rod which pushes out a plug fastened to the end of the retaining cord.

If the cord prolapses during the active stage of labor and the presenting part be on the pelvic floor, it is usually impossible to replace it. The obstetrician must then proceed to deliver as rapidly as the safety of the mother will permit.

Because the loop of cord cannot be felt to pulsate it does not always follow that fetal death is inevitable. Cases are on record where the cord at the time when it was carried into the uterus by the hand could not be felt to beat, and yet where a living child was afterward born. In these cases the circulation of the cord evidently becomes re-established after the cord is replaced.

INFECTION COMPLICATING LABOR

Patients in labor may become infected through the carelessness of those who attend them, or because pathogenic bacteria in the vagina make their way upward through the cervix into the uterus. Occasionally the amniotic liquid is

infected by bacteria from the intestine of the fetus before labor begins.

Signs and Symptoms.—Infection during labor produces fever of varying degree and disturbance of the pulse. If the infection remains localized in the genital tract and does not enter the blood the temperature rarely rises above 103½° F. If streptococci enter the blood the temperature may reach 104° F. or higher. The pulse rate varies with the severity of the infection and the resisting power of the patient. The vaginal discharge in these cases is frequently foul, or if without odor is dark red and fluid. The uterus may be tender upon pressure.

Pathology.—The pathology of this condition consists in the entrance of pathogenic bacteria through small lacerations in the cervix or through the decidua into the lymphatics and blood current of the uterus. If bacteria make their way into the substance of the placenta the blood stream speedily becomes infected. If the uterus be emptied with reasonable promptness and made to contract strongly, infection may be limited to the decidua and endometrium; but if labor with infection be prolonged systemic infection is almost inevitable.

Diagnosis.—The diagnosis of this condition is made by the altered pulse and temperature, the sensitiveness of the uterus, pain in the abdomen, altered vaginal discharge, and constitutional symptoms of infection. In severe cases chills may occur.

Prognosis.—The prognosis of infection occurring during labor is grave and should always be guarded. It is difficult to ascertain the precise infective agent, and usually the infection is of a mixed character and proceeds rapidly.

Treatment.—The treatment of labor complicated by infection consists in terminating labor as rapidly as possible with the least traumatism to the mother. If evidences of severe infection be present the infected uterus should be removed with the fetus.

If the operator decides that the uterus should not be sacrificed, and partial dilatation is present, he may terminate labor with the least traumatism to the mother. Unless the head be low down craniotomy is indicated, with the careful delivery of the child through the cervix, dilated by the gloved

hand under ether. The removal of the placenta should be followed by copious irrigation of the uterus with hot 1 per cent. lysol, followed by packing with 10 per cent. iodoform gauze. It is better to avoid closing lacerations in these cases to permit free drainage and to prevent the retention of infected material. Strychnia and ergot with digitalin, should be given hypodermatically, and saline intravenous transfusion is of positive value.

If the obstetrician decides that the body of the uterus is infected and that peritonitis threatens, the patient should be delivered by abdominal section, followed by the extirpation or resection of the uterus. Hysterectomy is the more practicable procedure and should be terminated by fastening the stump at the lower uterine segment outside of the peritoneum. This may be done by the original Porro operation, using a clamp, and leaving the clamp at the lower border of the abdominal incision; or by hysterectomy, stitching the stump at the extremity of the abdominal incision. The life of the fetus may be disregarded in these cases as most of these children perish from infection.

After the delivery of the patient her treatment is that of systemic infection, especial attention being given to keeping the uterus contracted, if it has been left, and sustaining the general strength and resisting power of the patient.

SUDDEN DEATH IN LABOR

One of the most tragic and hopeless accidents of parturition is the sudden death of the mother during or soon after labor.

Etiology.—No definite etiology has been made out for this occurrence. Those circumstances which tend to produce pulmonary embolus favor the accident, as many of these patients die from pulmonary embolism; others perish from sudden dilatation of the heart; others from rupture of a cerebral blood vessel; and in other cases no anatomical cause can be discovered. Unquestionably those conditions which depress and weaken the mother during pregnancy, and infections of the respiratory tract, such as grippe, predispose to this occurrence.

Diagnosis.—Without premonitory symptoms, and without especial difficulty in labor, the patient is suddenly seized,

if pulmonary embolism be present, with respiratory failure, the heart continuing to beat. Usually the patient rallies slightly and in a few cases under active stimulation, may gradually recover. In most cases a secondary collapse is fatal.

The symptoms of the condition are sudden respiratory failure followed by the rapid development of dilatation of the heart, and failure in the heart's action.

Prophylactic Treatment.—The possibility of this occurrence can never be dismissed from the mind of the obstetrician; hence it is his duty to bring all patients under his care during pregnancy to labor in the best possible general condition. In general, those forms of treatment which are depressing, exhausting and overwhelming, should be avoided during labor. Prolonged and unnecessary anesthesia, large doses of narcotics and depressing remedies, the occurrence of excessive bleeding, rapid and unskilful delivery, extensive lacerations, failure of the uterus to contract, and great mental and nervous shock, should all be avoided and if possible prevented. Those patients who are naturally inclined to disease of the heart and blood vessels, and who are highly nervous, are fit subjects for this accident.

Treatment.—The possibility of this occurrence makes it imperative that the obstetrician be always prepared to promptly stimulate a parturient patient. One or two reliable hypodermatic syringes, strychnia, digitalin, atropin and adrenalin, should all be in readiness at every labor. When in spite of precautions the accident develops, the uterus must be made to contract by manipulation, and stimulants given hypodermatically as near the heart as possible. Strychnia, digitalin and atropin, intravenous transfusions with salt solution and adrenalin, a mustard paste over the precordium, the inhalation of ammonia, should all be used as freely as possible. In hospital the Faradic current, one pole beneath the cerebellum and one over the heart, is useful. If the heart can be made to contract and a stimulant is forced into the lung, the patient may still recover, although embolic pneumonia will be inevitable. Should the accident occur before the child has been delivered, and the mother die, the child must be immediately delivered in the quickest way

possible. Usually the forceps suffices, but postpartum Cesarean section may be necessary.

The development of secondary shock within a few hours after the first attack should always be anticipated, and especially in cases where no abnormality in the circulatory apparatus can be detected, and where the element of nervous shock preponderates.

ECTOPIC PREGNANCY

When the ovum attaches itself outside its usual location within the cavity of the uterine body the condition is called ectopic pregnancy. According to location this may be divided into upper and lower ectopic gestation. In the former the impregnated ovum may remain in the Graafian follicle, in the Fallopian tube, or in the cornu of the uterus, and there develop until rupture of its capsule results. In the latter the ovum may attach itself to the wall of the uterus at the lower uterine segment, and its attachment and placental development gradually cover entirely or partially the internal os uteri. This latter condition is usually called placenta prævia.

Ovarian Pregnancy.—Clearly defined cases abundantly demonstrate the possibility of this condition. Obviously the ovum can only develop in the Graafian follicle but a short time when its attachment must extend to other and neighboring tissues. So the site of the ovum would be formed by the Graafian follicle, by decidua developed upon the surface of the intestine, the broad ligament, the peritoneal surface of the uterus, and the omentum or mesentery. Should the anatomical conditions be favorable, the ovum may form a complete sac among the intestines in the abdomen, and the embryo develop to a fetus at or beyond viability.

Diagnosis.—The diagnosis of ovarian pregnancy is impossible without abdominal section. Ectopic pregnancy may be recognized in these cases by a sensitive tumor where the ovaries may be, which is evidently separate from the uterus. The presence of decidua in the uterus may be demonstrated by removing the scrapings and subjecting them to microscopic examination.

The positive diagnosis of ovarian pregnancy is made at

section by finding an ovum whose sac in part is in the wall of the ovary. If the ovary be removed and subjected to microscopic section decidual cells can be demonstrated at the site of the Graafian follicle.

The etiology of this condition is unknown, except in so far as it shares in the etiology of ectopic pregnancy. Abnormal position of the ovary and fimbriated extremity of the Fallopian tube through adhesions from previous inflammation, and abnormal conditions of the lining membrane of the tube, both seem to have some bearing upon its occurrence.

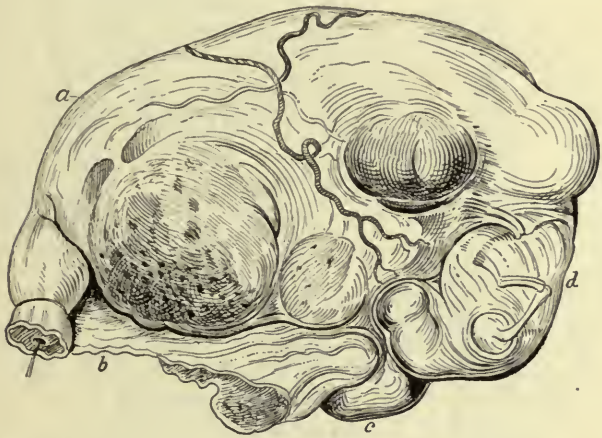

Fig. 100.—Unruptured tubal gestation with apoplectic ovum: *a*, tube distended with clot; *b*, ovary in section; *c*, cyst; *d*, fetus in sac of tube, limbs protruding.

Tubal Ectopic Pregnancy.—In this variety the impregnated ovum lodges in the Fallopian tube and there develops. If this occurs near the fimbriated extremity, and the tissues of the tube be firm and elastic, and the ovum becomes large enough to excite contractions of the tube by pressure, the ovum may be forced out through the fimbriated extremity into the pelvic or abdominal cavity, constituting tubal abortion. Should this not occur the ovum will grow until the distended tube can no longer contain it, when rupture will occur. Occasionally the impregnated ovum passes down-

ward after lodging in the Fallopian tube, finally reaching the uterine cavity.

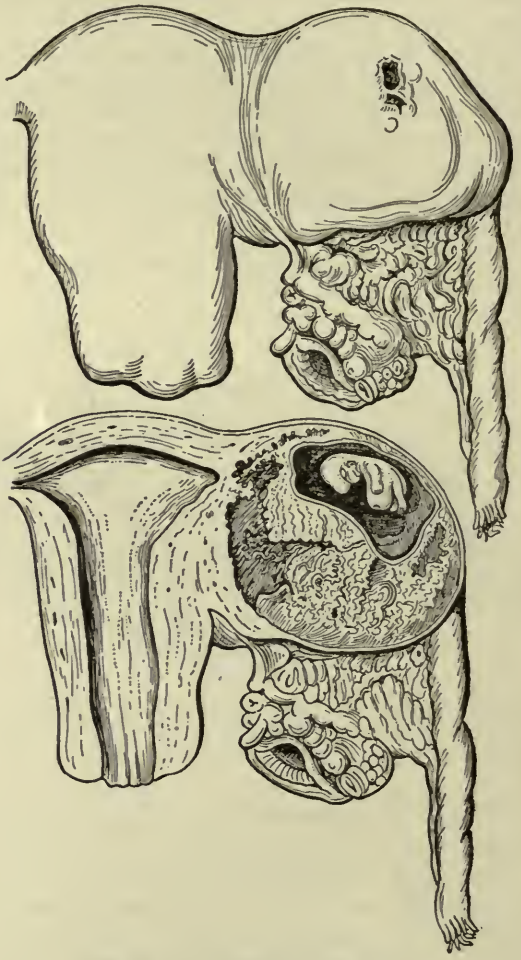

Fig. 101.—Interstitial pregnancy.

Cornual Pregnancy.—Cornual ectopic gestation comprises the lodging of the impregnated ovum in the wall of the uterus where the Fallopian tube enters the womb. Such a preg-

nancy can have but a comparatively short duration, as the tissue of the uterine wall will not stretch sufficiently to permit much development in the ovum. Rupture of the cornu at its external surface will develop and the ovum will die from hemorrhage, or be extruded into the pelvic or abdominal cavity.

Broad Ligament Pregnancy.—In rupture of a tubal pregnancy on the inferior surface of the tube the impregnated ovum and blood clot may pass between the layers of the broad ligament and there become practically encysted. The

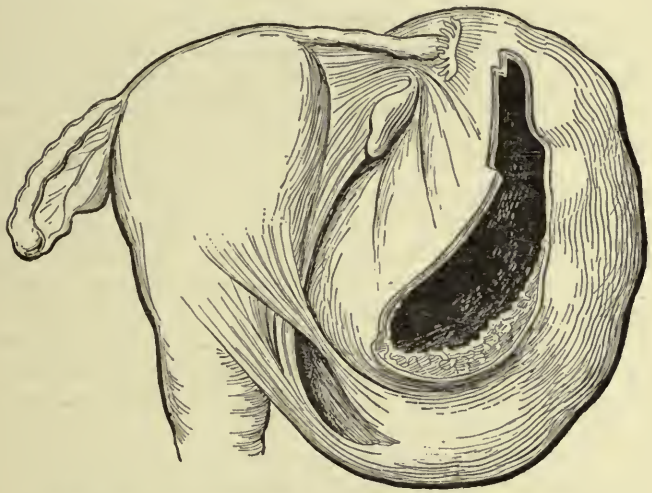

Fig. 102.—Uterus and sac of broad ligament gestation.

future course of the ovum will depend upon the possibility of the gradual enlargement of its envelope. Where the ovular sac can separate the layers of the broad ligament upward and backward sufficient room may be obtained to permit the development of the ectopic fetus to viability or beyond. If, however, the conditions are such that the ovum and its sac are subjected to firm pressure the growth of the ovum will cease and it will remain surrounded by a hematoma. Should infection from the adjacent bowel or other focus develop, pelvic abscess may result.

Diagnosis.—The diagnosis of early ectopic gestation, ovarian, tubal, cornual, or broad ligament, if rupture has not yet occurred, is often a matter of difficulty. If ectopic pregnancy is on the right side, with pain and slight disturbance of pulse and temperature, and there is sensitiveness on palpation, the symptoms may resemble those of appendicitis or salpingitis with exudate. If the pregnancy be upon the left side it may be confused with colitis and impacted feces in the upper portion of the rectum.

The diagnosis of ectopic pregnancy in the early months when rupture occurs is more simple and sure. Sudden pain and shock are the predominant symptoms. Nausea and vomiting so often seen in appendicitis are often wanting. Peritonitis may not begin at once, and a distinctly defined tumor can often not be made out, but the element of shock and anemia is most suggestive.

Where the tube has ruptured and the ectopic ovum has developed to some extent between the layers of the broad ligament a pelvic tumor can be outlined on vaginal examination. This will be somewhat elastic and boggy to the touch and somewhat sensitive. The presence or absence and the degree of leukocytosis should indicate the power of the patient's resistance and the possibility of infection and suppuration. The pulse and temperature will indicate the amount of hemorrhage and the patient's resisting power; but in ectopic gestation cases are often seen where a positive diagnosis is made only after the abdomen has been opened. The presence of severe shock suddenly would justify the opening of the abdomen, if no positive anatomical diagnosis could be made out.

Etiology.—The etiology of ectopic gestation, tubal, cornual and broad ligament, has been given in treating of ovarian pregnancy. A history of previous salpingitis is often obtained. In other cases painful menstruation and other symptoms point to defective development in the genital tract.

Prognosis.—In these cases the prognosis is always doubtful and usually grave. While it is true that some cases will recover without interference by the gradual cessation of bleeding and the absorption of the ovum and its envelope, in the

majority a fatal issue is caused by infection, acute anemia, and shock. The results of operation are so far superior to those of non-interference that where operation is undertaken by competent persons in good surroundings, the patient's chance is better than by expectant treatment.

Treatment.—These cases should be, if possible, transported to hospital as rapidly as can be done and immediately subjected to section. On opening the abdomen the point of rupture should be sought as promptly as possible and such tissue ligated as will immediately check bleeding. A bursted Fallopian tube should be removed and as much blood clot taken from the abdomen as the patient's condition will permit. If peritonitis is absent and the conditions have been favorable for clean operation the abdomen may be closed without drainage. If circumstances have been unfavorable for a clean operation, a cigarette drain or gauze bag should be inserted.

The point of great importance is the time for operation. The operator must delay sufficiently long to satisfy himself that the patient is not reacting from the original shock. It is often possible to wait an hour or two after the rupture of the envelope of the ovum until the patient has recovered somewhat. She will then bear anesthesia and operation much better than at the moment of rupture. If, however, no reaction is manifest immediate operation becomes imperative.

If the pregnancy is so far advanced that placental tissue has developed, the operator should abstain from forcibly separating this tissue from adjacent parts to which it has adhered. If the placenta has in greater part been formed and does not separate readily it should be left, the cord ligated and cut close to the placenta, the membranes sewed to the edges of the abdominal incision, and the membranes tamponed with 10 per cent. iodoform gauze.

In broad ligament pregnancy where hematoma forms and infection develops with suppuration, the abscess may often be opened to advantage through the vagina. Free drainage must be obtained, and a large soft rubber tube may be inserted through the vaginal incision into the abscess, and retained in position by vaginal packing with gauze.

Prognosis.—The prognosis of ectopic gestation of the varieties enumerated depends upon the diagnostic power of the practitioner who has the case, and the skill and judgment of the operator to whom it is entrusted. General practitioners should familiarize themselves with the signs and symptoms of ectopic gestation, and a competent operator should be called to the case as soon as possible. While an emergency operation for this condition may be done in the patient's house her chance of recovery will be greatly increased if she can have hospital advantages.

Abdominal Pregnancy.—When, after rupture of ovarian, tubal, cornual or broad ligament pregnancy, the ovum passes upward into the abdominal cavity, it may engraft itself upon the surrounding omentum, mesentery, peritoneum or bowel, and gradually develop a placenta and membranes, and the fetus may develop to viability or even to full term. In a few cases the abdomen has been opened and a living child delivered, which has survived. In the majority of cases the child dies through interference with the placenta, the amniotic liquid is absorbed, and the child becomes changed into a waxy or calcareous substance. In the latter stage it is known as a lithopædion. As such it may be retained indefinitely in the abdomen of the mother and may be discovered only years after its occurrence by post-mortem examination for some other cause.

Diagnosis.—The diagnosis of abdominal pregnancy at viability, with living fetus, is made by hearing fetal heart sounds, by outlining the fetal limbs and body, and by making out the empty and slightly enlarged uterus. In some cases the fetal sac is adherent to the fundus of the uterus and the two cannot be differentiated. The cervix uteri, however, does not develop in proportion to the period of gestation, and this may serve as a useful point in differential diagnosis. If the fetus dies within the abdomen of the mother and the amniotic liquid is absorbed it will constitute a tumor, when recognition by palpation may be possible.

Treatment.—In determining the treatment of a case of abdominal pregnancy heed must be given to the period of gestation and to the wishes of the parents. If the fetus is just viable and the mother is earnestly desirous of securing a

living child, and is willing to take the risk of prolonged gestation, the operator may wait until viability is assured before operating. If the fetus has died there is no reason for delay.

Where the patient does not wish to regard the life of the fetus and there is evidence that it still lives, the operator may wait its death to avoid the risk of hemorrhage, which inevitably follows separation of the placenta from the wall of the fetal envelope. In these cases intermittent pain occurs which simulates uterine contractions and which is soon followed by the death of the child. After evidence of fetal life has disappeared the operator may wait a few days, closely watching the mother's pulse and temperature, to give time for the plugging of the vessels of the placenta and of the placental decidua.

At operation the fetus should be removed with whatever amniotic liquid may be present. The placenta should then be sought but not disturbed, and the umbilical cord ligated and cut close to the placenta. No effort should be made to remove the placenta, unless it be so situated that it can readily be separated, leaving a smooth and even surface. Such separation is always dangerous and may be followed by fatal hemorrhage.

Without disturbing the placenta the other contents of the ovular sac should be removed gently and the membranes stitched into the lower portion of the abdominal incision. The sac of the fetus should then be tamponed firmly with 10 per cent. iodoform gauze and the end of the gauze brought out at the lower end of the abdominal incision. It is often advisable to use a Mickulicz bag in these cases, filling it with strips of gauze until firm pressure is exerted upon the entire fetal sac.

After-treatment.—These patients require stimulating treatment by hypodermatic injection at first, and then by mouth. The gauze should be gradually removed and should be discarded in from ten to fourteen days. The placenta will undergo gradual necrosis and will be gradually discharged through the abdominal opening. After the gauze has been removed the sinus which remains should be kept open by inserting as nearly to the bottom as possible a cigarette drain or strand of iodoform gauze.

The recovery of these cases is tedious, because of the length of time necessary to secure the removal of the placenta. Usually, however, complete recovery ensues.

Where the fetal sac becomes infected in abdominal pregnancy and pus forms, the suppurative process may penetrate the adjacent tissues and open upon the surface of the skin or into the bladder or rectum. Thus in one case a patient with anomalous symptoms noticed a discolored area near the umbilicus which gradually broke down and through which protruded the thigh bone of the fetus. This opening was subsequently enlarged and a fetal skeleton removed piecemeal. In cases of abdominal or pelvic pregnancy secondary to ovarian or tubal, fetal bones have made their way into the urinary bladder or into the rectum.

The treatment of these cases consists in cautiously enlarging the fistulous opening, removing as much of the contents of the sac as possible, and keeping the fistula open until the tract heals from the bottom.

Prognosis.—In abdominal pregnancy the mother's safety depends upon the unruptured condition of the fetal sac and the lack of disturbance by manipulation at operation with the placenta. When a fatal issue occurs in these cases it results from infection or from hemorrhage when the placenta is forcibly detached. Hence with good management the majority of mothers recover from abdominal pregnancy. Very few of the children are born alive and they are poorly nourished and developed, and few survive.

PLACENTA PRÆVIA

In this variety of ectopic gestation the impregnated ovum lodges in the lower uterine segment or in the cervix and so develops that in many cases the placental substance covers a portion or the entire internal os.

Etiology.—This variety of ectopic gestation occurs most frequently in ill-developed primiparæ or in multiparæ who have been weakened and in whom the uterus has been frequently over-distended by repeated gestation. The cause of placenta prævia is to be found in the condition of the endometrium and in the anatomical condition and contour of the uterus. If the endometrium be in an abnormal state, if it

be partially atrophied or deficient in tone or thickness, the ovum may gravitate to its abnormal position. If the uterus be poorly developed or its muscle thickened by repeated parturition the impregnated ovum will not find the anatom-

Fig. 103.—Placenta prævia; breech presentation, prolapse of foot: *cr*, contraction ring; *oi*, internal os; *oe*, external os.

ical conditions favorable for a natural lodgment in the uterine body and will gravitate downward to its abnormal position. Placenta prævia often accompanies twin pregnancy, and in some cases polyhydramnios is present.

Varieties.—This variety of ectopic gestation is commonly divided into central or complete placenta prævia, where the placenta completely covers the lumen of the internal os; partial or incomplete placenta prævia, where some considerable portion of the internal os is covered by placental substance; marginal placenta prævia, where the edge of the placenta comes to the edge of the internal os; and lateral placenta prævia, where the placenta is attached laterally to the wall of the uterus throughout the greater portion of the lower uterine segment.

It is evident that in these cases the situation of the placenta is such that the dilatation of the lower birth canal in the early stages of parturition must inevitably separate the placenta to a greater or less extent from its attachment, and thus produce more or less hemorrhage.

Signs and Symptoms.—Clinically speaking, the most significant symptom of placenta prævia is sudden, bright hemorrhage from the vagina during pregnancy without pain or without the occurrence of shock or traumatism. Sometimes this bleeding occurs during or after defecation. In many cases there is no warning, and no known cause for it. The uterus does not become sensitive in these cases, uterine contractions do not at first develop, there is little if any shock, and the patient is often so little affected by it that she will not believe the obstetrician's statement that the condition is dangerous.

On vaginal examination in placenta prævia the obstetrician will find increased temperature in the upper portion of the vagina and throughout the cervix. The blood vessels in this region will pulsate with unusual force. The cervix is softened and will usually admit at least one finger.

In making this examination the obstetrician should note the conditions of the cervix. In placenta prævia in primiparæ and in some multiparæ, the cervix is often unusually soft and relaxed. Dilatation is often present to some degree, and one or two fingers can usually be inserted. If the placenta is central the fingers will come against the uterine placental surface, which gives to the touch the feeling of raw flesh. If the placenta prævia be not complete the fingers will find some area within the internal os, where placental

tissue is absent and where the fingers come against the fetal membranes. If the membranes have completely or partially ruptured, recognition of this area is more difficult. Vaginal examination in placenta prævia is very important and should be very gently made. A rough examination will separate the placenta to greater or less extent and produce fresh hemorrhage. Care and thoroughness must be exercised in making this examination to determine whether an interval of membranes can be found which can be efficiently ruptured. If this can be done to advantage it may be a determining point in the selection of treatment.

Differential Diagnosis.—It is important to distinguish placenta prævia from abortion in the early months, and in the later months from accidental separation of the normally implanted placenta. Many early abortions undoubtedly result from placenta prævia, but it is difficult until the cervix will admit a finger to make the diagnosis. The presence of placenta prævia in the early months will be inferred when without known cause the patient has sudden bright copious hemorrhage.

In placenta prævia hemorrhage is without known cause. In accidental separation of the normally implanted placenta the patient is toxemic or there is a history of a blow, a fall, a kick, a sudden strain, or some other mechanical violence or great disturbance or shock. In placenta prævia the uterus does not at first contract and is not painful upon pressure. In accidental separation of the normally implanted placenta the uterus becomes tense, hard and very sensitive and painful to manipulation. In placenta prævia the hemorrhage is usually bright in color and often copious. In accidental separation of the normally implanted placenta the hemorrhage is usually dark in color, fluid in consistence, and rarely is a large quantity of blood expelled. In accidental separation the blood may be extravasated and remain within the uterus. In placenta prævia fetal life often continues in spite of severe maternal hemorrhage. In accidental separation of the normally implanted placenta considerable hemorrhage is usually followed by fetal death.

Prognosis.—The prognosis in placenta prævia depends primarily upon the absence of infection, as the greatest num-

ber of patients will perish from this source. While hemorrhage is dangerous it is rarely the sole cause of death and is principally important because it predisposes to infection. In placenta prævia the life of the child is always in danger and its safety will depend upon its prompt delivery. Central placenta prævia is most dangerous for mother and child, because the situation is such that the uterus cannot be emptied without dilating the cervix, and the cervix cannot dilate without separating the placenta. The same is true in varying degree with other varieties of placenta prævia, hence all cases of placenta prævia are cases of separation of the placenta in different degree, and all are cases of an abnormally situated or ectopic placenta, and not of a normally situated or entopic placenta. In no serious complication of pregnancy does the prognosis depend so much upon prompt and intelligent treatment. A mismanaged case of placenta prævia is almost inevitably fatal, while with skilful care the most desperate case will often survive.

Treatment.—The treatment of placenta prævia should under all circumstances be conducted with the same surgical appliances, technique, and surroundings which are given to the other varieties of ectopic gestation. Such cases should be immediately transported to hospital upon the occurrence of the first hemorrhage. Vaginal examinations should be as infrequent and as carefully made as possible and under thorough aseptic precautions. No substance should be introduced within the vagina, and the patient should be kept a clean surgical case with scrupulous care.

In hospital cases a careful examination should be made as gently as possible with the gloved hand, under antiseptic precautions. If mother and child are proportionate in size, the head or breech presenting in a favorable position, and a portion of the membranes can be found available for rupture, the membranes should be torn as completely as possible and as much amniotic liquid allowed to escape as is possible. The action of the uterus should then be stimulated by $\frac{1}{10}$th grain of strychnia hypodermatically, and 15 to 30 minims of an aseptic preparation of ergot injected hypodermatically. This will cause the uterus to act and force the fetus down against the placenta, preventing hemorrhage.

If the patient suffers severely from such uterine contractions, ¼ grain of codein may be given hypodermatically with the strychnia. She should be kept quiet, the external genital organs thoroughly made aseptic, and sterile vulvar dressings should be worn. The patient should be closely watched. The bladder should be emptied at regular intervals by catheter.

In these cases uterine contractions will gradually open the cervix and press the fetus down, carrying the placenta to the side, and preventing hemorrhage. No effort should be made to withdraw the fetus rapidly, and fetal life should be disregarded in the interests of the mother. When it is evident that the presenting part has reached the pelvic floor and is distending the perineum, if the mother's strength becomes lessened she may be delivered by forceps or manual breech extraction. The obstetrician must be prepared under aseptic precautions to follow the delivery of the fetus by the removal of the placenta, copious irrigation of the uterus with hot salt solution, or 1 per cent. lysol, and firm tamponing with 10 per cent. iodoform gauze.

Fig. 104.—Placenta prævia; introducing a dilating bag in forceps through the membranes to compress the placenta and dilate the cervix (after Liepmann).

Lacerations of the cervix, which often occur in these cases, should be immediately repaired by suture. If the mother's condition be good and post-partum bleeding does not occur, laceration of the pelvic floor and perineum may also be repaired. If the patient is weak and there is a tendency to post-partum bleeding, such lacerations should be left. The vagina should be tightly packed with sterile or bichloride gauze, care being taken to tampon firmly about the cervix, and a copious

and sterile external vulvar dressing should be applied, pressure being made over the vulva; and permanent uterine contraction should be procured by the hypodermatic use of strychnia and ergot. Should sudden relaxation occur, from 1 to 1.5 cc. of pituitrin given hypodermatically will usually cause prompt contraction. If the patient be anemic, intravenous saline transfusion will be of value. Warmth beneath the cerebellum and upon the surface of the body, absolute rest, and oxygen, are indicated. If by careful examination the cervix is dilated only sufficiently to permit the entrance of one finger, and no satisfactory point of rupture can be made out where the membranes can be opened, the patient should be immediately delivered by abdominal Cesarean section. Vaginal Cesarean section is not indicated in placenta prævia because the cervix and lower segment are enormously vascular, and profuse and possibly fatal hemorrhage would occur. Abdominal Cesarean section in these cases is done in the manner described in treating of the operation.

It is interesting to observe that hemorrhage ceases immediately upon emptying the uterus through the abdomen. After this the womb should be irrigated by hot salt solution poured from above, and thoroughly packed with 10 per cent. iodoform gauze, the end of the gauze being carried through the cervix. After the uterus and abdomen have been closed in the usual manner the vagina should be sponged out with bichloride solution and firmly packed with bichloride gauze. During the operation intravenous saline transfusion should be given and hypodermatic stimulation of strychnia, atropin, ergot and digitalin, administered.

In cases of ectopic gestation of the variety called placenta prævia which cannot be taken to hospital, and which must be treated in private houses, the mortality and morbidity are inevitably increased and the responsibilities and difficulties greater. The practitioner must keep in mind the cardinal point to conduct the case with scrupulous antiseptic precautions and with the least possible vaginal interference. Another point of great importance is the prompt treatment of the case when the first hemorrhage occurs. Such cases cannot be left without continuous observation, and danger is never over until the uterus has been emptied and is

thoroughly tamponed, the cervical lacerations repaired, the vagina tamponed, and the patient given appropriate general treatment.

In conducting a case in a private house the obstetrician requires the aid of other competent obstetricians or assistants, and a nurse or nurses trained in antiseptic methods.

Fig. 105.—Central placenta prævia. Braxton-Hicks version; bringing foot of the child through the placenta (after Liepmann).

If upon examination the placenta is found not to cover completely the internal os, but an area of membranes can be made out, the cervix should be very gently and carefully dilated at this point and the membranes torn as thoroughly as possible, allowing the free escape of amniotic liquid. The case should then be treated in the manner already described, care being taken to introduce nothing within the vagina ex-

cept the fingers of the gloved hand, and under antiseptic precautions. Before rupturing the membranes it is well to irrigate the vagina very gently with 1 per cent. lysol. The obstetrician or his assistants must remain in constant attendance upon the patient until labor develops and the case can be terminated in the manner described.

Fig. 106.—Central placenta prævia; foot brought down by Braxton-Hicks method; breech compressing the placenta (after Liepmann).

It is of especial importance in private houses that an obstetric anesthetizer should conduct the anesthesia and assist in the treatment of the patient at the time of delivery. The general practitioner is not competent to do this.

If in a case conducted in a private house the obstetrician can find no space available for the rupture of the membranes he must then cautiously dilate the cervix sufficiently to enable him to introduce the hand within the vagina, to pass several fingers through the cervix, tearing through the placental substance and catching and bringing down a foot of the fetus. This procedure requires skill, experience and judgment, and if improperly performed may separate a considerable placental area and bring on profuse hemorrhage. It is unsafe to tear through the placenta with a hard or sharp instrument, as the fetus may be severely wounded, and the mother's uterus may be ruptured. The foot should be gently but firmly drawn downward until the breech enters the pelvic brim, and the foot is near the vulva or protrudes from it. A loop of soft

bandage should then be passed about the foot so that traction can be made upon it. If the foot shows a tendency to recede, a weight of several pounds may be attached to the bandage to hold the breech firmly in the pelvic brim and against the placenta.

Having effected this, the obstetrician should absolutely desist from further effort at delivery. The external parts should be thoroughly cleansed again with antiseptic fluids, the fetal leg wrapped in sterile or antiseptic gauze, and the patient should be given small or moderate doses of strychnia and digitalin hypodermatically. If she suffers much pain codein in ¼ to ½ grain doses may be added to the strychnia. The bladder should be frequently emptied by catheter and the patient should receive such general stimulation as may be required.

This procedure should control hemorrhage and no effort should be made to hasten the patient's delivery. Such tonic or stimulation treatment as is needed may be given and the patient should be constantly watched for signs of developing labor. If she is restless and apprehensive, a moderate dose of morphia hypodermatically, with alcoholic stimulus, will usually induce refreshing sleep.

When the uterus begins to act and the child is gradually expelled precautions must be taken to have ready stimulants, antiseptic gauze, and materials for irrigation and for closing lacerations. Partial anesthesia may be necessary should the patient struggle and become unmanageable as the head is delivered. The child should be delivered as slowly and gently as possible, an assistant following down the uterus with the hand. The placenta should then be expressed and the uterus thoroughly irrigated with hot normal salt solution or 1 per cent. lysol. A firm packing of 10 per cent. iodoform gauze should be inserted and the cervix should be inspected for lacerations. If these are present, and if hemorrhage is occurring, they should immediately be closed with No. 2 chromicized catgut. The vagina should then be sponged out with an antiseptic solution, and if the pelvic floor and perineum are lacerated, and the patient's condition permits, such lacerations should be closed. If suture is not permissible they should be left, but thoroughly irrigated with

1 per cent. lysol. The vagina should be firmly packed with bichloride gauze, especial attention being paid to packing about the cervix so as to make pressure against the vessels of the lower uterine segment.

In these cases secondary relaxation with shock may develop within the first twenty-four hours. Preparations should be made to combat this; strychnia and digitalin should be available for hypodermatic use, with morphia and atropin. To maintain a tonic condition of the uterus a broad pad should be placed across the abdomen above the fundus and pressure made upon the entire abdomen by a many tailed bandage. The urinary bladder should be frequently emptied spontaneously or by catheter. Strychnia, digitalin and ergot, are required at regular intervals in moderate doses. For sudden relaxation pituitrin hypodermatically will be found useful. If severe shock with relaxation develops, the Faradic current with one pole beneath the cerebellum and the other over the uterus is a most efficient and valuable stimulant.

The Puerperal Period in Placenta Prævia.—The gauze should be removed in from forty-eight to seventy-two hours and one thorough but very gentle irrigation of the uterus and vagina given with 1 per cent. lysol. No other irrigation should be used. Strychnia and ergot will be found useful during the puerperal period, with iron, arsenic and gentian, if the patient is anemic. If it has been impossible to close lacerations at the moment of labor, and the patient's condition greatly improves, tears in the pelvic floor and perineum may be sutured in from two to three days after labor, after the gauze has been removed. If wounded surfaces have glazed over they may be scraped with a blunt-edge until they ooze slightly. Abundant liquid nourishment, fresh air, and attention to digestion and assimilation, are required in these cases. If the child survives, it may nurse the mother so soon as she has reacted and is evidently free from infection.

Frequency, Mortality and Morbidity.—It is estimated that central placenta prævia is present in one-fourth of all cases of placenta prævia, and among multiparæ more constantly than primiparæ. There is a possibility of its recurrence in the same individual in one case in 14. It occurs not infrequently with twin pregnancy, and polyhydramnios is often

present in these cases. Many of the less important forms of placenta prævia are not diagnosticated and are thought to be moderate post-partum hemorrhage, or possibly bleeding from the lacerated cervix before delivery actually occurs.

The mortality of placenta prævia is highest in the central variety. From 20 to 30 per cent. can be taken as an average with fairly good treatment. Where these cases are taken in hand after the first hemorrhage, under antiseptic precautions, the maternal mortality may be reduced to from 10 to 20 per cent. In proportion as treatment is prompt, antiseptic and surgical, the maternal mortality decreases. Thus in 18 cases of placenta prævia in which the greater portion of the os was covered by placenta, and in which the patients were treated by abdominal Cesarean section by the writer, all mothers recovered; three of these were exsanguinated at the time of operation.

The mortality of placenta prævia is highest in cases subjected to tamponing and attempted forcible dilatation of the cervix in private houses at the hands of unskilled operators. In other varieties of placenta prævia than central, the maternal mortality should not exceed 6 or 7 per cent.

The fetal mortality in central placenta prævia is at least 90 per cent. In all varieties there is an average of 60 per cent.

The fact that placenta prævia is attended by hemorrhage and the frequent development of septic infection gives it a high rate of mortality. From 10 to 20 per cent. is considered an average.

Placenta Prævia in the Early Months of Gestation Complicated by Infection.—When a patient in the early months of pregnancy has severe and repeated hemorrhages and becomes infected, her safety may demand the complete removal of the uterus unopened. On section many of these are found to be cases of placenta prævia. In these patients the septic uterus is considered as malignant, and the treatment is based upon the line of reasoning which suggests the complete removal of the cancerous uterus.

Prophylactic Treatment.—While it is difficult to describe a direct line of prophylactic treatment in this variety of ectopic gestation, it is obvious that the prevention and cure of chronic endometritis, the maintenance of the uterus in its

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normal position and in a healthy condition, and the avoidance of rapidly repeated and exhausting child-birth, may be of value in preventing placenta prævia.

The diagnosis of this condition in the early months of pregnancy might lead, after consultation, to the prophylactic emptying of the uterus and the termination of pregnancy in the interests of the mother.

MULTIPLE PREGNANCY

By this term is meant the presence in the uterus at one time of more than one impregnated ovum. This definition must now be revised to include cases where one impregnated ovum is present outside the uterus and one within the womb. Cases have been observed where twin pregnancy was present, one gestation being ectopic, the other entopic.

Twin Pregnancy.—Twin entopic pregnancy is the most common form of multiple gestation. If both embryos are developed from one ovum they are called uniovular, and the sex is usually the same. If two ova are impregnated at the same time, or with only a brief interval, the sex is usually different. Uniovular twins usually have one placenta and two amniotic sacs separated by a partition. Twins from two ova may have separate placentæ situated near each other, and possibly joined at the edge.

Etiology.—There is no definite cause for twin pregnancy, but its tendency is hereditary. Thus the women of some families produce twin children, and in the same line the same tendency is sometimes transmitted. Twins happen more frequently in multiparæ or in primiparæ above the average age of childbirth.

Location and Development.—When twin pregnancy is entopic one child is usually in head presentation, first position, the other in breech presentation, second position. In this way the bulk of the children is best accommodated in the uterus. Where twin pregnancy is entopic and ectopic, the ectopic embryo may be in any portion of the genital tract outside the uterus. In the most frequent forms of entopic twin pregnancy two fetal heads may sometimes be made out, one at the pelvic brim, one at the fundus; and two heart

sounds, one on the left side below the umbilicus, the other on the right side above the umbilicus.

If the patient's abdominal wall be unusually thick and if polyhydramnios be present, it may be impossible to diagnosticate twin pregnancy until one child has been born and the hand is introduced within the uterus. The abdomen

Fig. 107.—Twin pregnancy (after Liepmann).

is larger in size than normal, the sensation of weight and heaviness is greater, and pregnancy rarely goes to full term with twins.

Diagnosis.—Twin pregnancy may be suspected when the abdomen at six or seven months' gestation is unusually large. If on careful examination two heart sounds can be distinctly isolated, or if two heads can be distinctly pal-

pated, a provisional diagnosis may be made. The physician should anticipate premature labor, and preparations for birth should be made at least three weeks earlier than full term.

Treatment.—During pregnancy the mother of twins should be kept in the best possible general condition. As the uterus is over-distended it will not contract promptly unless the patient's muscular and nervous system is vigorous. Labor often begins by premature rupture of the membranes, and when this happens the patient should be kept in bed with sterile vulvar dressings so that the cervix may soften gradually, and thus give the best possible chance for preserving fetal life. At the moment of birth a skilled assistant should be in attendance to administer anesthesia and to watch the condition of the uterus and ensure good contraction. Should labor delay and the mother become tired, she should be given a small dose of morphia to secure rest. If labor does not proceed after this a tonic dose of strychnia may be given, and if the os is more than half dilated the membranes should be ruptured. The birth of the first twin usually follows without much delay. When the first child has been born and breathes well, its cord should be tied and cut and the child removed. The gloved hand should then be introduced to ascertain the presence of a second child, and its position and presentation. Usually the membranes of the second twin are found unruptured. Its bag of waters should be ruptured, with the hope that the head of the second child will present. If an anomalous presentation develops, the gloved hand should again be introduced and podalic version performed, and the second child delivered promptly.

No haste should be used in delivering the placentæ, and some opportunity should be given for the separation of the placentæ and the closure of the uterine sinuses. Strychnia and ergot are valuable given hypodermatically so soon as the children are delivered. If within a half hour the placentæ cannot be expressed, the gloved hand may be introduced and the placentæ removed, with the membranes and other uterine contents. The uterus should then be thoroughly irrigated with hot 1 per cent. lysol or salt solution, and firmly packed with 10 per cent. iodoform gauze. Lacerations of the cervix rarely require suture in these cases as the children are

smaller than the average. Should lacerations be present and bleed, the torn cervix should be closed with chromicized catgut. Such stimulation as the patient needs must be given, and especial care is required to secure prompt and permanent contraction of the uterus. The gauze packing may be removed in from forty-eight to seventy-two hours, and the uterus and genital tract thoroughly but very gently irrigated with 1 per cent. lysol.

Convalescence.—Convalescence from twin birth will be retarded by subinvolution, anemia and exhaustion consequent upon the effort to nurse two children. Subinvolution may be avoided by the antiseptic conduct of labor, the repair of lacerations, and the use of tonics, with small doses of ergot. Few mothers can nurse both children at once, but many can care for both during the day, and night feeding of cow's milk may be used to complete the nourishment. The children should nurse alternately, and may require additional care in the first weeks of life.

Twin Pregnancy, Entopic and Ectopic.—Where twin pregnancy is both entopic and ectopic, the ectopic pregnancy must be removed so soon as discovered. Should this not be done, there is danger that, when labor comes on, the sac of the ectopic pregnancy might be ruptured and bleeding follow. The removal of the ectopic pregnancy need not interrupt the entopic. If the entopic pregnancy terminates before the discovery of the ectopic gestation, the latter should be removed at the conclusion of labor if the patient is in good condition; and if not, so soon after as possible. There is always risk with manipulation and disturbance incident to uterine contractions, and the delivery of the fetus may rupture the sac of the ectopic ovum.

Pregnancy Other Than Twin.—Pregnancy with triplets, although rare, has been observed once in between 2000 and 3000 births, and once in 8000 births. The statistics of a number of countries show that triplets occur once in 6558 births. Quadruplets have been observed once in 307,000 births. The greatest number of impregnated ova known to have been in the uterus at one time is those in a case of sextuplets, of which the specimen is preserved in one of the Italian museums.

Diagnosis.—The exact diagnosis of multiple pregnancy other than twin is rarely made until labor. Even then their presence is unsuspected until with the birth of two children the uterus still remains large. The introduction of the hand reveals the presence of the third.

Course of Pregnancy.—Pregnancy rarely goes so far as with twins because of the greater distention of the uterus. Labor is often tedious because of inefficient uterine contractions, and frequently the services of a physician are required to deliver the child. The tendency to relaxation and hemorrhage are greater and additional precautions are necessary. Delivery itself is not difficult, and podalic version with extraction is the method usually employed. The children are often ill-developed and poorly nourished, and require unusual care after birth.

HEMORRHAGE COMPLICATING PREGNANCY, LABOR, AND THE PUERPERAL PERIOD

Hemorrhage is always a serious complication because it weakens the patient and often makes manipulation necessary, which exposes the patient to additional risk of septic infection.

Accidental Separation of the Normally Implanted Placenta.—This accident is sometimes described as concealed accidental hemorrhage because the blood may clot within the uterus and but little escape externally.

Etiology.—Conditions of the endometrium which give the embryo a feeble attachment predispose to placental separation. Altered states of the blood, like toxemia, produce the same result. Mechanical injury, as in a fall, a blow, a kick, a sudden strain, or rapid and sudden motion, is a frequent cause. The umbilical cord coils about the fetus so that it becomes unduly short and may make traction upon the placenta.

Signs and Symptoms.—The course of this accident will depend somewhat upon the site of the placental separation and the care which the patient receives. Where separation is at the lower border of the placenta—that nearest the os—the blood will escape from the placenta and make its way between the membranes and the uterine wall and issue through

the cervix. The blood is not retained in these cases, the presence of hemorrhage gives warning, and therefore the case is more favorable for the patient than other varieties of this condition.

If, however, placental separation occurs at the upper portion of the placenta extravasated blood will clot between the placenta and the uterine wall; this clot will act as a foreign body, irritating the uterine muscle to contract, and by its gradual increase will gradually separate the placenta from the wall of the uterus. This blood will be retained oftentimes in clotted masses, not reaching the cervix until the uterus has begun to contract or the membranes rupture.

The presence of clotted blood within the uterus excites tonic uterine contraction. The womb becomes hard, very sensitive to pressure, and fetal heart sounds cannot be heard nor can fetal movements be felt. The patient's pulse and temperature rise somewhat and she is often restless, and gradually begins to complain of air hunger. If there is slight vaginal hemorrhage this ceases when she lies down, and the patient will frequently avoid sending for medical aid because bleeding stops when she reclines, and she imagines from this occurrence that she is safe. When sufficient blood accumulates in the uterus to bring about increased uterine action labor gradually develops, and when the fetus has been expelled or removed a mass of blood clot with a partly or wholly separated placenta is found within the womb. Sudden and often fatal shock may follow the emptying of the uterus, and patients may die of exhaustion or pulmonary embolism. The necessity for manipulation and the hemorrhage expose the patient to added risk of infection.

Diagnosis.—When a pregnant patient complains of pain in the uterus and abdomen with slowly but steadily rising pulse and with some vaginal discharge of blood, accidental separation of the normally implanted placenta may be suspected. The character of the hemorrhage is of practical importance, for in accidental separation the blood is rarely bright in color, but dark and sometimes coffee-ground in appearance. As hemorrhage slowly but gradually increases the mother's pulse becomes more rapid, weak and compressible, she complains of air hunger and is restless, the

uterus which has been painful gradually relaxes, and the tone of the uterine muscle is completely lost. Patients may die undelivered, or perish soon after birth from exhaustion and acute anemia.

The differential diagnosis between placenta prævia and accidental separation of the normally implanted placenta has already been given. In early gestation many cases of abortion result from this accident and confusion in diagnosis might arise between this condition and ectopic gestation.

Treatment.—If such cases are left without interference and the woman be healthy, and but slight separation has occurred as the result of mechanical causes, if the patient be put at absolute rest separation and hemorrhage may cease and pregnancy may go on to full term. It is rare, however, for all the conditions necessary for this result to be present. When the physician is summoned to such a case and finds the uterus not very tender, the pulse and temperature but little disturbed, and moderate hemorrhage only with the history of accident, the patient should be put at absolute rest in bed, sedative medicines should be given, and the patient kept under close observation, with the hope that pregnancy may continue.

In a striking case in the experience of the writer a patient pregnant between seven and eight months was thrown from a sleigh, following which bright vaginal hemorrhage occurred. The uterus became somewhat tender, and the pulse and temperature were somewhat elevated. Rest in bed with sedative medicines and liquid food, resulted in cessation of the hemorrhage and the continuance of pregnancy to full term, with the spontaneous birth of a living child.

Where, however, the symptoms do not cease, but the uterus becomes more tender and rigid, and the pulse and temperature more disturbed, action is imperative.

There is but one way in which the situation can be controlled, and that is by emptying the uterus in the most prompt and harmless manner possible. Like ectopic gestation these cases should be at once taken to hospital. If the pregnancy has not advanced beyond the seventh month, many operators prefer vaginal Cesarean section under antiseptic precautions and under careful anesthesia. If pregnancy is

further than the seventh month, abdominal Cesarean section may be selected.

If the patient should not be transported to hospital and whatever treatment is available must be carried out in a private house, the use of the tampon, with the administration of opium, has given good results. To accomplish this under antiseptic precautions, the urinary bladder is emptied by catheter and the vagina thoroughly irrigated with 1 per cent. lysol. The vagina is then packed as firmly as the patient can endure it with 10 per cent. iodoform gauze, one strand of which should be introduced if possible through the cervix. A firm large pad is then placed above the fundus and a large many tailed bandage applied upon the abdomen in such a manner that the uterus is pressed strongly downward toward the pubes. Sufficient opium is given by hypodermatic injection to relieve the patient's pain and to act as a cerebral stimulant. The patient should be kept absolutely quiet, but under close observation. After a varying interval the cervix will dilate and hemorrhage may occur sufficiently to stain through the vaginal packing. Should this happen, this packing must be removed, the vagina irrigated, and another packing introduced as thoroughly as before. Opium, strychnia and digitalin may be administered as the patient's condition justifies, until the uterus begins to act and the cervix is at least one-half or more dilated. When the cervix becomes dilated or dilatable the physician, with competent assistance, may remove the packing cautiously, complete dilatation by the gloved hand, rupture the membranes, and bring down a foot and leg of the fetus, bringing the breech down as a plug. No further attempt should be made to deliver, but the uterus should be stimulated to contraction by strychnia, ergot or pituitrin hypodermatically given. When the breech is expelled spontaneously the physician may deliver the arms and head. The uterus must be at once emptied of the placenta, clots, membranes and cord, thoroughly irrigated with 1 per cent. lysol, and packed firmly with 10 per cent. iodoform gauze. The patient is often in such a condition that lacerations cannot be immediately repaired. Intravenous saline transfusion, heat beneath the cerebellum, the Faradic current, the inverted position, the injection of

adrenalin, artificial warmth, fresh air and oxygen, and opium as a cerebral stimulant, are all indicated.

The treatment during the puerperal condition has been described under the treatment of placenta prævia.

The mortality from accidental separation of the normally implanted placenta depends upon prompt diagnosis and efficient treatment under antiseptic precautions. The frequency of the accident can only approximately be estimated as from 1 to ½ per cent. in a large number of cases. The maternal mortality varies from 32 to 46 per cent., the fetal mortality from 85 to 94 per cent. The morbidity is considerable because hemorrhage invites infection, and manipulation is necessary.

Hemorrhage Complicating Pregnancy from Rupture and Lacerations of Vessels.—The veins of the broad ligaments become enormously distended during pregnancy and may rupture from direct violence, as a severe fall, a blow, or a kick. This bleeding can only be inferred from the general signs and symptoms of hemorrhage with tenderness over the broad ligament. Its hidden nature and uncertain character demand prompt removal to hospital and treatment by abdominal section. The ruptured veins should be ligated and intravenous saline transfusion and other stimulation employed.

Varicose veins in the vagina or vulva or in the lower extremities complicating pregnancy may rupture and occasion severe bleeding, producing syncope. Fortunately the diagnosis is apparent because the lesion is superficial. Under antiseptic precautions the ligation of the veins in the vulva and vagina and in the lower extremities, and the application of a pad over the point of rupture, with the bandaging of the entire extremity, will control the bleeding.

Highly toxemic patients may bleed during pregnancy from the uterus and the bleeding may be uncontrollable and prove fatal. The altered state of the blood is responsible for this accident.

Hemorrhage from Lacerations.—As labor proceeds, the cervix may lacerate sufficiently to produce hemorrhage. This is seen in cases where the uterus is poorly developed, where the tissues are inelastic, and the cervix does not dilate

normally. Such lacerations are usually not considerable and such cases can be successfully managed by making multiple incisions in the cervix, rupturing the membranes, and allowing the presenting part of the child to make pressure upon the cervix. It is often necessary to terminate labor by artificial extraction.

During labor, when the head is upon the pelvic floor, the perineum may rupture or the wall of the vagina may tear as the head descends. Such bleeding is usually controlled by the pressure of the presenting part, but if this should not occur sutures should be taken, the needle passing deeply beneath the point of hemorrhage.

Internal bleeding during labor may be suspected when without known cause the patient suddenly manifests symptoms of shock and hemorrhage. Usually rupture of the uterus accompanies these symptoms, and hemorrhage is an important factor. Immediate removal to hospital, and treatment by section are the only efficient remedies.

Hemorrhage Occurring after Delivery from Lacerations.—The torn cervix not infrequently bleeds after delivery of the child. The blood is bright and comes constantly in a small stream. Torn vessels in the anterior segment of the pelvic floor may bleed after delivery, and from them the hemorrhage is bright, inconsiderable in quantity, but constant. Arteries in the posterior segment of the pelvic floor and vagina may also sustain laceration and bleed after labor.

Diagnosis.—The diagnosis of cervical bleeding is important because it is often mistaken for bleeding from uterine sinuses caused by relaxation of the uterus and commonly known as post-partum hemorrhage. Bleeding from the cervix may occur when the body of the uterus is firmly contracted. Bleeding from uterine sinuses is copious, often sudden, and sometimes intermittent; and bleeding from the torn cervix is comparatively small in quantity, bright in color, and constant.

Prophylactic Treatment.—Where it is evident that the cervix, pelvic floor and vagina, will dilate with difficulty and that laceration is inevitable, this may be lessened by the use of anesthesia at the moment of delivery and by preliminary dilatation with the gloved hand of the physician. If artificial

delivery be practised care should be taken to extract the child slowly and with intermittent traction, and to maintain flexion of the head during delivery.

Curative Treatment.—The treatment of lacerations in the cervix, pelvic floor and vagina, accompanied by hemorrhage, consists in suture under antiseptic precautions. To do this a favorable position of the patient, a good light, surgical appliances, antiseptic technic, and prompt assistance, are necessary. Usually anesthesia can be avoided. The cervix should be grasped, each lip separately with tenaculum forceps, and gently drawn down until it can be readily inspected. Lacerations will then be seen and usually the site of hemorrhage. The lacerations should be closed by No. 2 chromicized catgut. If the uterus has been packed an end of the gauze should be brought out in the centre of the cervical canal. Care must be exercised to carry the first stitch high up at the side of the cervix so that it may compress branches of the cervical artery which are large at that point. The proper application of stitches is followed by the immediate cessation of cervical bleeding.

Lacerations of the anterior segment of the pelvic floor often bleed persistently and may greatly annoy the physician. Here immediate continuous suture with fine catgut promptly checks the hemorrhage.

In the posterior segment of the pelvic floor and perineum catgut sutures in the vagina, carried deeply through the tissues, will stop bleeding, while in the perineum deep stitches of fine catgut through the muscles and vagina, and superficial stitches of silkworm gut will stop the hemorrhage.

In private houses, under the care of the general practitioner, accurate suture under antiseptic precautions, is usually impossible. A good light is often wanting, assistance is lacking, an antiseptic outfit may not be at hand, and while the taking of these stitches is not a serious operation, its success requires some experience and operative skill. Under these circumstances the practitioner will control hemorrhage, at least to some extent, and less promptly by tamponing the uterus, if this has not been done, with 10 per cent. iodoform gauze, and firmly packing the vagina with bichloride or iodoform gauze. A firm pad over the perineum and a firm gauze

compress over the anterior segment of the pelvic floor, with a strong T-bandage, will make efficient pressure.

Post-Partum Hemorrhage.—By this term is commonly meant hemorrhage from the genital tract following labor. But much of this is hemorrhage from lacerations in the cervix, the pelvic floor and perineum.

The treatment of these lacerations, and the treatment of post-partum hemorrhage from relaxation of the uterus and the patent condition of the uterine sinuses, is so different that the term post-partum hemorrhage is often inaccurate and misleading. We understand by post-partum hemorrhage bleeding from the uterine sinuses caused by relaxation of the uterine muscle.

Etiology.—Those cases which predispose to a relaxed and weak condition of the muscular system of the patient, and especially of the uterus, predispose to post-partum hemorrhage. Such are rapidly repeated pregnancies, over-distention of the uterus from an excessively large child or twins, or polyhydramnios, an acute infection like pneumonia or typhoid fever, which affects not only the blood but the muscle of the uterus, poor development of the uterine muscle, as in anemic primiparæ, and the exhaustion and muscular distention incident to prolonged and difficult labor. Toxemia from any cause greatly predisposes to hemorrhage because it reduces the coagulating power of the blood, alters the substance of the muscle, and thus prevents competent contraction. Rapid delivery by forceps or version when the uterus is not acting may be followed by complete relaxation and severe bleeding.

Signs and Symptoms.—The signs and symptoms of hemorrhage from a relaxed uterus are the appearance of a copious flow of blood from the vagina. If, however, the blood clots firmly in the uterus the clot may close the cervix and blood accumulate within the uterus, and external hemorrhage be very slight. Under these circumstances, the intrauterine clot slowly increases in size until it excites strong uterine contractions, when the clot may be expelled followed by free bleeding, exhaustion and shock. Patients may bleed severely from a relaxed uterus and still recover, if they do not

become infected. In some patients twenty-four hours after the initial hemorrhage, relaxation and bleeding recur.

Prophylaxis.—No case of labor should receive attention by physicians without prophylactic treatment for postpartum hemorrhage. This consists in bringing the woman to labor in the best possible condition. Relaxation of the uterine muscle is preceded by exhaustion, and the signs and symptoms of this condition should be accurately known by the physician, and instruction in this knowledge should also be given to trained nurses.

Gradual failure in the vigor, force and frequency of uterine contractions, increasing rapidity of the patient's pulse, with a weaker pulse, slight disturbance of temperature, restlessness, failure to sleep, and beginning distention of the abdomen with gas, are signs of exhaustion which should not be overlooked. These patients sometimes become excitable, suffering severely mentally, and begging for relief. At other times they are apathetic and often stuporous.

Diagnosis.—The diagnosis of exhaustion of the uterine muscle in labor cannot be made without a thorough knowledge of obstetrics. First in importance is the ascertaining of the presence of some mechanical condition which is making spontaneous labor impossible. Such, for example, would be contracted pelvis, overgrown child, posterior rotation of the occiput or the chin, brow presentation, parietal bone presentation, transverse position in shoulder presentation, cord coiled about the fetus shortening the free portion, a greatly distended urinary bladder, excessive cold in the external atmosphere, and the debilitating effect of excessive heat.

When exhaustion has reached the stage of tetanic contraction of the uterine muscle, which precedes relaxation, the uterus is firm, tender upon palpation, and the patient's pulse and temperature are considerably elevated. Accompanying the muscular exhaustion is the general fatigue of the nervous system, which shows itself in restlessness, inability to sleep, constant complaint of pain, and sometimes in nausea and vomiting. The pulse becomes rapid and often weak, and the patient's expression anxious and haggard.

The Diagnosis of Hemorrhage.—Ordinarily hemorrhage is evident because blood from the uterus escapes through

the vagina. If, however, a clot forms, closing the cervix, the blood may be retained and the uterus gradually become distended, while bleeding continues. The condition of the uterine muscle is the most valuable sign in recognizing the severity of hemorrhage. If the uterus be small and firm, continuous hemorrhage comes from a torn cervix; if hemorrhage be profuse and the uterus be flabby so that it can scarcely be outlined, blood is pouring from the uterine sinuses. If there be moderate vaginal hemorrhage, but the uterus is soft on pressure and steadily enlarging, a clot is re-

Fig. 108.—Grasping the uterus after delivery to prevent post-partum hemorrhage.

tained within the uterine cavity. Where uterine rupture occurs with intra-abdominal hemorrhage and sudden pain and shock, followed by cessation of uterine contractions, it indicates rupture.

The Results of Post-Partum Hemorrhage.—If post-partum hemorrhage be not controlled, the patient may bleed to syncope, and death may ensue from the formation of pulmonary embolism or acute cerebral anemia. If the patient does not perish immediately, septic infection is very apt to supervene and prove fatal. If the patient survives hemorrhage and

sepsis, thrombosis is likely to develop, convalescence is rarely retarded, and the patient may be unable to nurse her child.

Treatment.—It is useless to treat post-partum hemorrhage without having first in importance the condition of the uterine muscle. When hemorrhage occurs, the uterus should at once be firmly grasped between the four fingers, carried directly down and behind the uterus, and a thumb placed upon the centre of the anterior uterine wall. If the uterus is not grasped parallel to its long axis, but if the hand is applied to the side of the uterus, the ovary may be pinched by pressure, and the patient may manifest signs of pain and shock. The uterus properly grasped should be compressed firmly and carried forward over the pubes. If the womb is so relaxed that it cannot be grasped, it must be briskly but lightly rubbed and kneaded until its shape is distinctly outlined and it can be grasped. So soon as this has been effected the patient should be given strychnia $\frac{1}{20}$ to $\frac{1}{15}$ grain, digitalin $\frac{1}{50}$ grain, atropin $\frac{1}{200}$ grain, together hypodermatically. A preparation of ergot suitable for hypodermatic use should be given, a syringeful injected at a time deeply into the muscles of the thigh or in the buttocks. This dose of ergot should be repeated in half an hour if needed. A copious hot vaginal irrigation of boiled water, sterile salt solution, or lysol 1 per cent., should be given

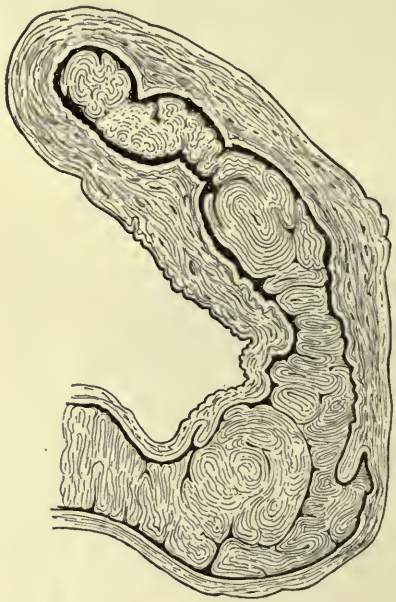

Fig. 109.—The correct and successful tamponing of the genital tract in post-partum bleeding.

with a long suitably curved glass tube, and the tube should be inserted within the cervix to wash out any clot that may be in the lower uterine segment.

These measures will control nine out of ten cases of post-partum hemorrhage. Should the uterus after responding to treatment again relax, it will be necessary to irrigate the uterine cavity with hot 1 per cent. lysol, or sterile salt solution, and to pack it thoroughly with 10 per cent. iodoform

Fig. 110.—The genital tract inefficiently tamponed to prevent post-partum hemorrhage; *a*, a clot which formed in the empty fundus above the gauze; *b*, the gauze not carried beyond the lower portion of the uterine cavity (after Bumm).

gauze. This procedure is dangerous unless the physician has the necessary appliances to maintain asepsis. Several assistants, physicians or nurses, are needed to control the patient during this application. Anesthesia should be avoided if possible.

To insert the packing without anesthesia the vagina should be irrigated with 1 per cent. lysol, and the gloved left hand introduced within the vagina with the fingers be-

hind the cervix, the palm being directed toward the pubes. The end of the strip of gauze in uterine dressing forceps is then passed along the palm of the hand within the vagina to the cervix and introduced within the cervix. Several folds of gauze are thus carried into the cervix, when the fingers of the left hand should be inserted, and with the fingers the gauze should be thoroughly packed at the fundus of the uterus. During this manipulation the uterus should be pressed downward by an assistant, and the gauze should be introduced by the forceps and fingers until the entire cavity of the uterus is thoroughly tamponed. Sufficient gauze should be left, to which can be tied a strip of bichloride gauze with which the vagina should be firmly packed.

Fig. 111.—Momburg's tourniquet bandage applied to check uterine hemorrhage (Leipmann).

It is dangerous, unless the uterus is grasped by tenaculum forceps, and drawn down, to tampon the uterus with dressing forceps alone, as this instrument may be passed through the uterine wall. If the forceps be used to place the gauze only within the cervix, and the gauze be packed by the hand, the operator can be sure that the fundus is properly tamponed and that the packing is efficient. If the packing does not reach the fundus, bleeding will continue above the gauze and a clot form, which will prevent proper contraction of the womb.

Patients sometimes complain of considerable pain from uterine contractions, increased by the presence of gauze. If such pain is severe and annoying, a moderate dose of

morphia should be given hypodermatically. Salt solution should be introduced by hypodermoclysis or by rectal injection, combined with whiskey and freshly made hot coffee. In extreme cases intravenous saline transfusion should be practised. Adrenalin 1 to 1000 may be added to the salt solution if desired. When the uterus remains contracted for some time, the grasp of the hand may be omitted and a firm pad placed above the fundus, and a many tailed bandage applied over the abdomen, carrying the uterus downward and forward. The foot of the bed should be elevated so that the patient is in the Trendelenberg posture, the lower limbs may be bandaged from the feet to the groin, and the upper limbs from the fingers to the axilla; a hot water bottle covered with dry flannel should be placed beneath the cerebellum, oxygen should be inhaled, and the patient's body surrounded by external warmth. The Faradic current, one pole beneath the cerebellum and one over the uterus; or one pole beneath the cerebellum and the other over the heart, is an excellent stimulant. Pituitrin is valuable to secure rapid and vigorous uterine contraction, but its effect is less enduring than that of ergot and strychnia.

Secondary Hemorrhage.—Usually within twelve hours a secondary collapse with relaxation and hemorrhage must be expected. To prevent this, strychnia, digitalin and ergot should be given hypodermatically at intervals of three or four hours. After the first dose of morphia, codein in ½ grain doses, should be substituted. Rectal injections of whiskey and salt solution should be given every four hours. Warmth should be continuously applied, oxygen inhaled, and by the mouth small quantities of hot water with aromatic spirits of ammonia. With these precautions, the development of secondary shock can often be prevented and the patient gradually brought into a tranquil condition, when she will sleep.

If she is desirous of seeing the child, and the child be in good condition, it may be put to the breast once or twice.

So soon as the danger of secondary shock is over, the patient should be given peptonized milk, orange albumin, broth, beef juice, or raw eggs beaten up, every two hours. If she craves tea or coffee, such may be used sparingly.

Care must be taken to avoid disturbing the stomach, and formation of gas, and only very easily digested food in small quantities should be given frequently.

The pad above the uterus should be retained and the gauze packing, for from forty-eight to seventy-two hours. When the gauze is removed the uterus should be thoroughly irrigated with warm lysol, and no further irrigation should be practised. After the first week of convalescence, the patient should receive, in place of strychnia and ergot, nux vomica, Fowler's solution and gentian, before food, and a suitable preparation of iron after food, four times daily.

Uncontrollable Hemorrhage.—Cases are occasionally seen where post-partum hemorrhage is uncontrollable. A highly toxemic condition of the mother may render this possible, the patient may apparently recover from post-partum bleeding, but the uterus remains large, and frequent attacks of irregular hemorrhage may develop. In these cases, one must suspect the formation of syncytioma malignum. In some patients a pendunculated fibroid, which has become a fibroid polyp during labor, may be retained within the uterus and cause repeated and considerable bleeding. Occasionally a small portion of retained placenta may cause severe and irregular hemorrhage, which does not cease until the portion of placenta has been removed.

The Treatment of Complications.—Where secondary hemorrhage with shock develops, it is usually necessary to remove the gauze packing and to re-apply it. In the hemorrhage of toxemia packing should be used, although if the toxemia be severe treatment is unavailing, and the patient dies. Where repeated hemorrhage depends upon the presence of a polyp, it will cease upon the removal of the polyp; and where syncytioma malignum is present, extirpation of the uterus is the only procedure which will control the bleeding.

The Instruction of Nurses in Managing Post-Partum Hemorrhage.—In all efficient training schools for nurses and in maternity hospitals nurses are instructed to control post-partum hemorrhage until a physician can arrive. The signs and symptoms of exhaustion are clearly described, and those methods of treatment which the nurse can carry out

are plainly taught. We are accustomed, in the Maternity Department of the Jefferson Hospital, to instruct nurses when relaxation and hemorrhage occur, to do three things, in the order named:

First, to remove any binder or bandage from the abdomen, to rub the uterus until it can be grasped, to grasp it firmly, and to carry it forward and downward over the pubes and hold it there.

Second, to give to the patient hypodermatically $\frac{1}{20}$ grain of strychnia, $\frac{1}{50}$ grain of digitalin, and one syringeful of a suitable preparation of ergot for hypodermatic use. Pituitrin may be substituted for ergot.

Third, to give to the patient a copious hot vaginal douche of 1 per cent. lysol, salt solution, or boiled water, the glass tube to be carried into the cervix and into the external os.

This instruction has enabled our nurses to control all cases of post-partum hemorrhage occurring in the absence of a physician until a doctor arrives.

Lactation After Hemorrhage.—Lactation is often slow in developing and the child may not at first thrive upon the milk of a mother who has suffered from hemorrhage. The effort to have the mother nurse the child must not be abandoned, and the child should be artificially fed until the mother recovers from the first anemia and shock. To encourage secretion of milk, if the child does not nurse, the breasts should be pumped several times daily and gently massaged.

Death From Exhaustion Following Hemorrhage.—In some cases, although bleeding ceases, it seems impossible for the patient to rally. Stimulation may be pushed as far as is permissible, but the patient remains in a wakeful, somewhat restless condition, with very rapid and feeble pulse and subnormal temperature. In these cases, if the patient be put at absolute rest and given morphia hypodermatically, the nervous system may rally and the patient recover. Strychnia must be used with caution in these cases, for if given in excess it tends to exhaust rather than stimulate the patient.

SEPTIC INFECTION

By septic infection we understand the entrance into the mother's lymphatic and blood circulation, before, during or after labor, of pathogenic bacteria. The organism resists such infection by fever and so the term septic fever is often applied. As such most frequently develops after labor, the term puerperal fever has been long in use.

The Causes of Septic Infection.—The streptococcus is the most common and efficient cause of septic infection in parturient women. Staphylococci, the pneumococcus, the bacillus coli communis, the bacillus proteus vulgaris, the diphtheria bacillus, the germ of erysipelas, and various diplococci, may cause this condition. In some cases unclassified bacteria are present.

The Mode of Infection.—Infection may arise among parturient women from germs already in the body before pregnancy or labor, or from germs introduced usually within the birth canal by some manipulation.

While researches are confusing concerning the bacteriology of the vagina, it is admitted by most that streptococci and other bacteria are often present in the vagina in pregnant women who are apparently in good health. While their growth is usually inhibited by the acid mucous secretion of the vaginal mucous membrane, and while the entrance of these bacteria into the uterine cavity is generally prevented by a plug of tenacious sterile mucus in the cervix, still bacteria from the vagina frequently gain access to the uterine cavity and may enter the circulation at the placental site.

Septic infection by direct contamination is seen in its most complete example in the work of the criminal abortionist. In his hand a non-sterile uterine sound is introduced through the cervix during early pregnancy, carried roughly about the uterine cavity until it ruptures the sac of the embryo and wounds the decidua, and often the wall of the uterus. In other cases of criminal abortion the patient herself may introduce an object which is not sterile within the uterus, or dirty midwives or other attendants, by repeated vaginal examination, may wound the mucous membrane in the cervix and introduce bacteria into its lacerations.

The Course of Septic Infection.—The course of septic infection in parturient patients will depend upon the virulence of the infective germ, and the mode and location of its introduction within the patient's body. If streptococci in pure culture are introduced into the blood stream at the placental site or through some lacerated surface, severe constitutional infection will rapidly develop. If less virulent bacteria, in mixed cultures, be introduced into a wound or laceration of the mucous membrane of the genital tract, lymphangitis will result and the infection will develop much more gradually. If the patient has been a subject of previous salpingitis and has pyosalpinx when conception occurs, should this pyosalpinx rupture during pregnancy, or during or after labor, its contents may be highly virulent and rapidly developing peritonitis may result.

Where cancer of the cervix complicates pregnancy and labor mixed infection almost inevitably develops. Staphylococci, probably from the skin, gain access to the mammary glands during pregnancy and have been extracted from the first breast milk before the child has tried to nurse. Any pre-existing focus of infection containing pus or cultures of bacteria which may have ruptured during or after labor may result in active infection.

Pathology.—The pathology of septic infection in parturient women is essentially that of wound infection in surgical cases. Where streptococci enter the blood directly, if the patient's immunizing powers are not sufficiently great to destroy the bacteria they rapidly establish metastatic foci in the lungs, liver, spleen, kidneys and brain, and in various portions of the peritoneum, the walls of the uterus and connective tissue and vessels of the broad ligaments and pelvis, and may produce multiple embolism and thrombosis. The toxins formed by these bacteria exert a poisonous and paralyzing influence upon the heart muscle, death occurring from cardiac syncope.

Where staphylococci and their bacteria in mixed culture be present lymphangitis usually develops, with foci of infection and abscess formation in the course of the lymphatics. Pyemia may ultimately result with joint infection, and pyemic involvement of serous membranes such as the peri-

cardium and pleuræ and peritoneum. As the uterus is usually the organ through which infection enters the circulation, and the general organism, it exhibits all the characteristic lesions of sepsis. The lymphatics early become infected and the uterine decidua. Infected bacteria break through the zone of cellular resistance beneath the decidua and enter the lymphatics and blood vessels between the muscle fibres. The uterine peritoneum becomes involved, infection spreads to the Fallopian tubes, and pelvic peritoneum and pelvic abscess may form. Small suppurative foci may also develop in various organs of the body and suppurative meningitis, pleurisy or peritonitis, may occur. In mixed infection when patients perish it is usually from exhaustion and pyemia.

Septic Infection During Pregnancy.—In those cases where the original point of infection can be made out, lymphangitis can usually be traced from this point through the generative tract. In the early months septic infection is usually preceded by abortion. In later pregnancy, when the membranes have formed, septic infection may develop in the uterine decidua through contamination, and infective bacteria may make their way through the membranes and attack the fetus. Thus the fetus in utero delivered by Cesarean section has developed gonorrheal ophthalmia.

Septic Infection During Labor.—If the pregnant patient has a focus of previous infection with retained septic material, the disturbance of labor may rupture the collection and cause septic material to enter the lymphatics and blood vessels. If the patient has been infected by contamination early in labor, and birth be prolonged, acute lymphangitis may result. Repeated vaginal manipulation and examination without proper antiseptic precautions may cause fresh infection, and in prolonged labor may result in conditions of great gravity.

Treatment.—The treatment of septic infection complicating pregnancy calls for the emptying of the uterus in that manner which shall be attended by the least traumatism. Dilatation of the cervix with solid dilators sufficient to permit packing of the uterus with a narrow strip of gauze will be sufficient. Under stimulation with strychnia, the uterus

will expel its contents including infected material. If septic metritis be present in the early months, the uterus may be removed through the vagina and the pelvic cavity be drained. If there is reason to believe that the uterus has been ruptured by the sound of the criminal abortionist, abdominal section, hysterectomy, and drainage may be performed.

Septic infection developing during labor calls for the termination of pregnancy in that manner which shall occasion the least traumatism to the birth canal. The use of dilating bags, if the child be small, or craniotomy upon the full term child, may be advisable. At or near term the Porro operation with extra-peritoneal treatment of the stump, may save the mother's life.

PUERPERAL SEPTIC INFECTION

This condition most commonly results from a deposit of pathogenic bacteria in wounds and abrasions in the perineum, pelvic floor and cervix. From forty-eight to seventy-two hours after such invasion the patient has a rise of temperature and pulse, sometimes preceded by a chill. The height of the fever will depend upon the virulence of the infective agent and the resisting power of the patient. If thrombosis and embolism be not present, the increase in the pulse will correspond with the rise in temperature; but if thrombosis and embolism in any degree be present the pulse will be more disturbed than the temperature. Locally the patient will complain of burning and pain in the genital organs, especially upon any disturbance and manipulation. A film or secretion of yellow-grayish pus forms upon abraded and infected surfaces, which consists largely of leukocytes and bacteria. The initial rise of temperature and the pulse disturbance are followed by remission and the temperature may fall several degrees. During the following afternoon or evening the temperature and pulse again rise, and remain comparatively high during the night. If infective bacteria make their way along the lymphatics the cervix is entered and also the lymphatics, the uterus and the decidua. The lochial discharge is at first suppressed and then becomes altered in character. If streptococci predominate the lochial discharge is dark red with little if any odor, and clots but

feebly. If mixed infection predominates the lochial discharge is muco-purulent, with characteristic odor. The secretion of milk is checked and the uterus becomes involved, and the patient complains of pain in the abdomen. The abdominal wall is sensitive to palpation and the abdominal muscles are partly fixed to prevent pain. If the uterus be palpated it is tender on pressure.

As the infection travels upward from the uterus, the veins of the broad ligaments become thrombosed and chills, followed by fever and sweating, will give evidence of pyemia. Other septic foci from various portions of the body may develop, and septic pleurisy with exudate or pericarditis or endocarditis, or peritonitis, may result. Where emboli form the joints become involved and multiple joint abscess may develop. The meninges of the brain and cord may be attacked and meningitis with exudate or cerebral abscess may result. In virulent streptococcus infection the embolic phenomena may predominate and retinal embolism may cause blindness. The action of the bowels is usually checked at first and gas accumulates in the intestine, but this is often succeeded by diarrhea and sometimes by septic enteritis. The urine is albuminous and may contain bacteria in abundance. Cystitis is not uncommon and surgical kidney may develop. Death usually results from exhaustion, from cloudy swelling, and fatty degeneration of the heart muscle with acute dilatation. Death from exhaustion more than from any one lesion is not uncommon.

The duration of mixed infection in the puerperal period may vary greatly in proportion to the virulence of the bacteria and the patient's power of resistance. Where streptococci predominate, a fatal termination may result in a week or ten days after the initial lesion. Where lymphangitis with mixed infection is present and metastasis develops the patient may be ill for weeks or even several months, finally perishing from exhaustion.

Direct infection of the blood stream at the placental site, with streptococci, is the most virulent and active form of puerperal sepsis. These cases often result from the manual removal of the placenta without antiseptic precautions. In these cases there are no infected lesions in the lower genital

tract, the lochia remains a dark reddish fluid with little or no odor, peritonitis may be present in extreme degree or absent, and death usually ensues from multiple embolism. Multiple skin lesions in petechial patches may be present.

In all septic infections the uterus remains in subinvolution, is larger than normal, and the uterine muscles softened and infiltrated with bacteria and their products.

In puerperal septic infection the mammary glands may become involved and septic metastasis may develop. The milk is unfit for the child's use, as it contains bacteria and toxins. The child may become infected with the mother and manifest the characteristic signs and symptoms of the condition.

The Resistance of the Organism to Infection.—The resistance of the organism to infection is shown by fever, by the development of leukocytosis, by fixation abscess, by eliminating discharge as diarrhea and sweating, and by the patient's inability in many cases to take large quantities of nourishment of those substances which increase the resisting power of the blood. It is noticeably true in iron and arsenic, which may often be pushed to extraordinary quantities in these patients. The patient's thirst shows the necessity for a free supply of water to maintain the circulation. The immunizing subtances in the patient's blood, the antitoxins and antigens which are formed in favorable cases, greatly disturb the bacteria and neutralize their antitoxins. The patient may be said to be making a good fight against infection when she has fever, but of moderate severity, when the character of the pulse remains good, the heart sounds clear, and the heart action regular; when there is no severe delirium and no well pronounced stupor; when evidences of pyemia and embolism do not develop; when the abdomen remains reasonably soft and without excessive tenderness; and when the patient can take and assimilate large quantities of nourishment, iron, arsenic, water and oxygen. The patient may be said to be resisting poorly when her temperature is very high or persistently sub-normal; when the pulse rises before the temperature falls; when the heart sounds are not clear but are faint or muffled; when the heart action is weak and irregular; when the abdomen is greatly

distended and very sensitive or is scaphoid and without sensation; when the phenomena of embolism or thrombosis do not develop; and when the patient's mental and nervous condition do not show great depression or melancholia or active delirium. Leukocytosis is of value as an indication of the patient's power of resistance, and a moderate leukocytosis is always a welcome sign. The detection of streptococci in the blood has formerly been considered an absolute indication of a fatal result, but this conclusion cannot be accepted as universally correct, and patients occasionally recover, although this condition be present.

Puerperal Septic Infection From Pre-existing Foci.—If a patient who has had salpingitis or appendicitis or other local infection in the pelvis or lower abdomen comes into labor, the mechanical disturbance caused by labor may rupture this focus, setting free pathogenic bacteria and causing the development of infection. In the puerperal period an infection may have become localized and remain quiescent and be set free by the patient's motion or by some exertion.

To illustrate the former, in the experience of the writer, a primipara passed through a normal labor under antiseptic precautions. Two days later she had fever and rapid pulse, for which no cause could be given. On cross-questioning she finally described pain about one of her upper teeth, which she said had given trouble for some time after she became pregnant. A dentist was called, who opened an abscess in the periosteum of the jaw, from which several ounces of foul pus escaped. The symptoms of septic infection disappeared and the patient made a good recovery. The pre-existing infection had caused the development of pus formation by the disturbance incident to labor.

Another patient had passed through normal labor under antiseptic precautions apparently well, and had been allowed to do light work about the ward. After lifting a half-bucket of coal she complained of pain in the lower abdomen and gradually developed symptoms of abdominal infection. When the abdomen was opened a bursted pyosalpinx was found and beginning general peritonitis, from which the patient died.

Diagnosis.—All patients during pregnancy should be inspected to ascertain the existence of any possible focus of infection. If labor has proceeded favorably under antiseptic precautions, and symptoms of infection develop, the patient's entire body should be examined as thoroughly as possible to determine the presence of some localized infection. If tenderness be found over the appendix, operation should immediately be done. If an infected tonsil be present it must be drained, and any collection of pus should at once be evacuated. When the focus can be found and extirpated, symptoms of infection disappear and the patient goes on to recovery.

Autoinfection.—Cases are occasionally seen where mixed infection, usually from the intestine or from the blood current, develops after labor without known injury or direct contamination. In the experience of the writer the bacillus coli communis infection of the intestine, developing after labor, resulted fatally in a puerperal case. This was proved by autopsy.

Another patient who had normal labor, under antiseptic precautions, was subjected to abdominal section at the puerperal period, when the pelvic organs were found normal. The appendix was removed and its base was found reddened and swollen, the descending colon swollen, dark red in color, and beneath its peritoneal coat patches of ulceration could be seen. This patient made a tedious recovery, with the use of gauze drains and stimulation.

Labor occurring in a pregnant woman suffering from erysipelas, cancer, acute syphilitic ulceration of the genital tract, abscess in Bartholini's gland, or infection by the typhoid bacillus or pneumococcus, may be followed by acute septic infection in the puerperal period. In some of these cases the course of the infection is rapid, its virulence of high degree, and the result fatal. These occurrences in no way lessen the responsibility of the obstetrician, and antiseptic precautions should be universally followed in all cases of pregnancy and labor. Unless some other cause can be definitely demonstrated, puerperal septic infection must be considered as due to some lack of antiseptic precautions or some error in manipulation or in operative procedure.

The Prophylactic Treatment of Puerperal Septic Infection.—The fact that patients may develop foci of infection during pregnancy is a most cogent reason for having pregnant patients put under medical care. The nose and throat, if abnormal, should receive special and proper treatment, and infected foci should be destroyed. The mouth and teeth should be put in thorough good order. Any painful dental operation should be avoided, and carious teeth and suppurative gums or periosteum, must be cured before labor. The patient should be put in the best possible condition for resisting infection by the proper hygiene of pregnancy and by especial attention paid to her nutrition. If there is evidence of infection of the vagina, a foul discharge or ulcerated condition of the mucous membrane, the application of carbolic acid, or nitrate of silver to ulcerated surfaces, followed by gentle irrigation with lysol, should be practised. The patient should be warned against the possibility of self-infection, if the fingers are introduced within the vagina during labor. Exhaustion and hemorrhage favor the development of infection from bacteria already within the birth canal at labor; so the patient must not be allowed to become exhausted and every precaution must be taken to avoid hemorrhage.

As toxemic patients readily develop infection, the patient's diet and excretory functions require attention.

During epidemics of acute infectious disease, such as smallpox, vaccination with proper vaccines, or the prophylactic injection of serum, should be used as in the non-pregnant. The writer had repeatedly seen antitoxin protect pregnant patients after exposure to diphtheria, and with no bad results for mother or fetus.

Obstetric Antisepsis and Asepsis.—On the advent of labor the patient's bowels should be thoroughly emptied if possible by a laxative medicine, followed by copious irrigation with normal salt solution, and care should be taken that fecal matter does not enter the vagina. The hair about the external genital organs should be shortly trimmed or shaved, the external parts thoroughly cleansed, and tincture of green soap and warm water followed by rinsing with sterile water, and then with bichloride of mercury 1:4000, or lysol 1 per

cent., should be employed. When the urinary bladder is empty the region about the urethra should be freely flushed with an antiseptic solution. During labor a sterile vulvar dressing should be worn and kept in position by a T-bandage.

We have already described the antiseptic precautions necessary in the conduct of labor. Thorough surgical preparation of the hands and forearms of the obstetrician and nurse, the use of sterile rubber gloves, the wearing of clean or sterile operating suits and sterile gowns, and the precautions which would be taken in a well appointed operating room, by surgeons and nurses, are all necessary.

During the expulsion of the child a pad of gauze wrung out of antiseptic solution should be placed over the anus of the mother to prevent bacteria from the intestine gaining access to the birth canal. During labor the patient should be surrounded by sterile linen, and all appliances and instruments employed should be sterilized by operative surgical methods.

The Antiseptic Treatment of the Birth Canal.—During the early years of antisepsis the effort was made to prepare the birth canal of the parturient women for labor as one would prepare the skin for abdominal section. The mucous membrane of the vagina was scrubbed with pledgets of cotton dipped in an antiseptic solution, and vaginal douches of antiseptic solutions were repeatedly and freely given. The result was disappointing, for infection was not present in all cases, and in some seemed to be roused into activity by the measures taken to prevent it.

When it is remembered that the vagina and cervix are protected against infection by a sterile secretion of considerable germicidal power, it will be obvious that to remove its secretion forcibly and to wound the capillaries and lymphatics and the mucous membrane, must tend to produce infection and not to prevent it; so in healthy patients no vaginal douche or interference should be practised during the early stages of labor. The birth canal should be disturbed as little as possible by vaginal examinations, and these should be made with the gloved hand as gently as possible. If there has been considerable vaginal catarrh during pregnancy a very gentle irrigation of 1 per cent. lysol may be given before the membranes rupture.

In prolonged and difficult labor especial attention must be given to prophylactic antisepsis. External cleansing should be repeated by flushing with an antiseptic solution before and after each examination or manipulation. No vaginal delivery should be attempted unless the cervix is dilated or easily dilatable, and those methods of delivery should be chosen which inflict the least traumatism upon the mother. The prompt closure of lacerations under antiseptic precautions after labor, is important in preventing infection.

Obstetric Asepsis.—By obstetric asepsis is meant the strict enforcement of the rule that nothing that has not been sterilized should be allowed to touch the genital tract of the patient during labor. While the application of strong antiseptic solutions to the birth canal is a mistake, still there is no exception to the rule of asepsis. So sterile linen and sterile appliances and sterile dressings with sterile gowns and gloves and instruments and suture material, and the knowledge that in the healthy woman the birth canal is practically sterile and requires no interference, has greatly lessened puerperal mortality and morbidity.

The Treatment of Puerperal Septic Infection.—So soon as this condition occurs the first duty of the obstetrician is to see that no infective material has been retained within the uterus. For this purpose the uterine cavity should be very gently explored by the fingers of the gloved hand, or better, by gentle irrigation with normal salt solution, or 1 per cent. lysol, through a hollow stemmed, blunt edged curette. This should be used simply as a long finger to pass gently over the lining of the uterus and bring away any loosened bit of placenta or membranes. Under no circumstances should vigorous and thorough curetting with a sharp-edged instrument be undertaken

If this simple manipulation causes free hemorrhage the uterine cavity should be thoroughly packed with 10 per cent. iodoform gauze. It is also essential that the intestinal tract be emptied as promptly and thoroughly as possible. A combined cathartic pill, followed by repeated small doses of salines, gives good results. A copious irrigation of the colon with hot normal salt solution should be given. If lacerations have been closed by suture, such sutures should be removed

and the wound allowed to gape open and painted with tincture of iodine or irrigated with 1 per cent. lysol. To secure good contraction of the uterus, tonic doses of strychnia and ergot are necessary. For abdominal pain a turpentine stupe and dry ice bag give good results.

Food and Stimulants.—To combat successfully puerperal septic infection, the mother requires an abundant supply of the most nutritious and digestible food. Milk in every digestible form and sometimes pancreatised, beef juice, barley, oat or wheat jelly, chicken jelly, junket, orange, lemon, grape fruit or pineapple albumen, the juices of these fruits with the white of an egg, will be found useful. Liquid food every two to three hours, an abundant supply of good drinking water or Celestin Vichy, are important.

If stimulants are required, it must be remembered that alcohol is not a stimulant. Strychnia and digitalin are the most valuable stimuli which we possess for this condition. This may be given every four to six hours with nourishment. To this may be added for septic patients who are anemic, tincture of chloride of iron in doses ranging from 5 to 30 drops well diluted. Alcohol should be used, if needed as a sedative, to produce sleep and to spare the body of the patient from excessive waste. The best quality of whiskey or brandy well diluted, in doses varying from one-half ounce to an ounce, should be given in the afternoon and night. If the patient be accustomed to tea and coffee, a moderate quantity of this will not do harm.

The Reduction of Temperature.—The temperature in puerperal sepsis should not be reduced unless it seems to oppress the patient. A dry ice bag upon the abdomen and sponging are useful, and gentle rubbing with alcohol is soothing to the patient.

As the temperature is an index of the patient's effort to resist, a temperature of from 100 to 102° F. is of better import than a continual subnormal temperature.

Specific Medication.—If the uterine lochia be obtained without contamination and found to be rich in streptococci, the use of antistreptococcic serum would seem indicated. Experience shows that in some cases antistreptococcic serum is followed by prompt improvement, while in others it pro-

duces no effect. Where diphtheritic infection complicates the puerperal state antitoxin has given good results. Where mixed infections are present vaccines may be prepared and are used by many with considerable success. It is too soon as yet to know their absolute value. Remedies which tend to increase leukocytosis, as nuclein, have been useful in some cases.

Increasing the Patient's Resistance to Sepsis.—While the use of nutritious material is of the utmost importance, this may be supplemented by other methods of treatment. To dilute the toxins in the blood, and to stimulate the secretion of the bowels and kidneys, salt solution may be given by the drip method. The establishment of what is termed fixation abscess seems of value in some cases and seems to cause an increased production of immunizing material. Inunction with Crede's silver ointment apparently operates in the same manner. In desperate cases direct transfusion of blood has been of value.

The Nervous System in Puerperal Septic Infection.—It is of the utmost importance that nothing be done in the treatment of puerperal septic infection to depress the nervous system. Thus antipyretic drugs should never be used. A temperature so high as to depress the patient should be reduced by cold, while the nervous system is protected by alcohol used as a sedative. An abundance of pure air or the inhalation of oxygen is valuable for the nervous system.

Where pain cannot be controlled by counter-irritation and cold, and where the patient is becoming hectic, morphia hypodermatically is valuable. The mental condition of the patient should not be disturbed by noise or excitement, while the mind should be stimulated by a hopeful atmosphere.

Nursing in Puerperal Septic Infection.—This is a most valuable adjunct in the care of the patient. A skilful nurse can do more than any other person to guard the resisting power of the patient. In long-continued cases, the prevention of bed-sores, the care of the skin, the careful feeding of the patient, the judicious use of alcohol, the procuring of a constant supply of fresh air, are matters of the greatest importance. Written orders should be given by the attending obstetrician, and written and detailed reports and charts kept by the

nurse. A summary of the nourishment, stimulus and alcohol taken during the twenty-four hours should be prepared. Severe cases require several nurses with unremitting attention to sustain the strength of the patient.

Nurses must be warned against the danger of personal infection through abrasions in the hands, and rubber gloves should be worn in cleansing the genital organs of the patient and in changing her clothing.

No nurse should go directly from a septic to a clean case, but abundant time should be taken to thoroughly sterilize all clothing and personal belongings, to take frequent antiseptic baths, to have the hair thoroughly washed, and made aseptic, and to spend considerable time in the open air.

The Surgical Treatment of Puerperal Septic Infection.—The hopes of the profession were at first considerably raised by the belief that prompt hysterectomy would save many cases of puerperal septic infection. Unfortunately, when a positive decision to operate can be made the infective bacteria have long since passed from the uterus into the blood stream of the patient's general circulation. Hence hysterectomy has been largely abandoned except in cases of sloughing and infected fibroid tumors or suppurating ovarian cysts. Ligation of the veins of the broad ligaments has likewise found supporters, but again this process must be viewed as a conservative one on the part of nature to prevent further spread of infectious bacteria. Hence the majority believe that these thrombosed veins should be let alone.

Concerning the opening and draining of collections of pus complicating puerperal septic infection, there can be no doubt. This procedure is based upon general surgical grounds and is universally adopted. This would naturally include the removal of a pyosalpinx, if such could be diagnosticated.

Where the pelvic peritoneum and Fallopian tubes are involved in septic infection good results have been obtained by opening the abdomen, loosening pelvic adhesions, removing pus tubes, and opening the posterior vaginal vault. The pelvic organs are replaced in as nearly as possible their natural position, and the pelvic cavity behind them is filled with 10 per cent. iodoform gauze. The posterior vault of the vagina is then freely opened and the gauze passed downward

into the vagina. The abdomen is then completely closed and the gauze gradually removed from below.

Pryor's method for this condition consisted in opening the posterior vaginal fornix very freely from side to side. Adhesions were separated as far as possible by the gloved fingers, and small collections of pus were opened by this method. The uterus was carried upward and the cervix backward; iodoform gauze was then introduced through the vagina to carry backward the intestines and to thoroughly drain the pelvic cavity.

These procedures have much in common and are conservative in their nature.

Complications of Puerperal Septic Infection.—Mastitis and breast abscess not infrequently accompany puerperal septic infection. In all cases of sepsis the child must be taken from the breast. The infected breast should be immobilized by a dry ice bag placed over the infected area and a broad breast bandage. If there is much pain, lead water and laudanum may be applied under the ice bag. If the infection does not subside, incision and drainage are necessary. Multiple joint abscesses may complicate the recovery of the patient with puerperal septic infection. These must be opened and drained as the conditions require. Septic pleurisy may require aspiration of purulent fluid from the thorax.

Thrombosis and Embolism.—The external saphenous vein and sometimes the deeper veins of the body may become plugged by septic thrombi during the puerperal period. In the case of the thigh the limb must be elevated, lead water and laudanum and an ice bag applied over the site of the thrombus, and should infection of the skin occur, with suppuration, this should be drained by multiple long incisions. Where foci of infection develop in the internal organs the infection may be disseminated by multiple embolism, which may plug the retinal artery, causing blindness, or produce the death of the patient by pulmonary embolism.

Convalescence from Puerperal Septic Infection.—This will depend upon the vigor of the patient and the treatment which she receives. In ill-developed and ill-nourished primiparæ and in multiparæ exhausted by frequent childbirth,

septic infection may rapidly proceed to a fatal termination. On the other hand, some of the most desperate cases recover under skilful and constant care.

The period of convalescence varies in accordance with the severity of the infection and the resisting power of the patient. Several months may be required before the patient regains her strength, and in some cases her former health never returns.

Septic Infection Attacking the Fetus during Pregnancy.— Infective bacteria may gain access to the fetus during pregnancy through the blood stream of the mother, or through the placenta, or through the amniotic liquid. Typical examples of the first are blood stream infection, as seen in acute infective diseases. In typhoid, in pneumonia, malaria, syphilis, and other acute infections, the fetus shares the mother's disease. Thus, a fetus expelled during these diseases will be found to contain infective germs and to have the characteristic lesions. In fetal infection from the mother's blood, obviously the only means of treatment lies in remedies administered to the mother. It is impossible to treat the fetus separately, and all that can be done is to treat the mother in the most efficient manner possible.

In estimating the dose of antitoxins or sera given to pregnant women it is well to use these remedies in full doses, for thus the fetus will receive the greatest benefit. The interruption of pregnancy in the interests of the fetus is not advisable, for it can best be treated through the medium of the mother's blood, and its chance of recovery is best if it remains in the mother's womb.

Unquestionably the placenta has the function of disposing of a considerable quantity of infective bacteria in the protection of the fetus. How great this protective power may be in a given case cannot be accurately estimated. Also the youth and general vigor of the mother indicate the healthy placenta and good protecting power from this organ; and, on the contrary, a multipara exhausted by frequent child-bearing, or a primipara much above the average age, will furnish poor placental protection. Evidence of the success or failure of this function of the placenta is found in characteristic lesions and the disease observed in

the placenta after birth. Microscopic examination in these cases will demonstrate the presence of the infective germ, and in severe cases characteristic alterations in the blood vessels of the placental tissue.

During pregnancy infective bacteria may make their way into the cervix, and in some instances penetrate the fetal membranes. The amniotic liquid may thus become infected and may be swallowed by the fetus, causing infection of the gastro-intestinal tract. Such infective bacteria have been demonstrated in the amniotic liquid and are undoubtedly a cause of infection of the maternal peritoneum in cases of delivery by Cesarean section.

The prevention of this condition lies in cleanliness on the part of the patient during pregnancy and in the avoidance of vaginal examinations and manipulation by infected hands or appliances. We have no direct method of treating this complication.

Inspiration Pneumonia.—After the membranes have ruptured, infective bacteria from the vagina may make their way into the fetal sac, and if the fetus makes respiratory movements, may enter its air passages. This is one of the dangers incident to long labor with ruptured membranes, and to those manipulations, such as version, which may introduce infective bacteria into the fetal sac and excite involuntary respiratory fetal movements.

The symptoms of inspiratory pneumonia in the new-born originating in utero, are fever, rapid pulse, acute toxemia, and death. The lungs of the newborn child do not unfold normally, its breathing remains tubular, the lungs remain dull on percussion, and unnatural breath sounds can sometimes be detected.

The treatment of inspiration pneumonia in the newborn is entirely stimulating and tonic. The free use of oxygen, small doses of strychnia, digitalin, and atropin, given hypodermatically, and the careful use of dry cold over the chest, are indicated.

To combat the toxemia which develops, free flushing of the intestine with equal parts of sterile salt solution and boiled water, is indicated. If the child can swallow and assimilate the breast milk its chance for recovery is greatly improved.

If this is not the case the prognosis is always exceedingly grave. The disease does not run a typical course, for pneumonia, but its duration and severity depend upon the variety and number of the infective bacteria.

While the active treatment of inspiration pneumonia is often unsuccessful, much can be done to avoid this condition. Strict antisepsis in the condition of labor, the use of rubber gloves in obstetric operations, thorough dilatation of the cervix before attempting vaginal delivery, the avoidance of unnecessary manipulation and disturbance during vaginal delivery, and the use of sterile vulvar dressings during prolonged labor, are all useful.

In Cesarean section with unbroken membranes, the amniotic liquid should be emptied at the moment of operation as completely as possible before the child is extracted. Remembering the infective nature of this fluid, it is safer to deliver the child with the uterus turned out of the abdomen than by allowing it to remain in situ.

Septic Infection in the Newborn.—If the fetus has shared the mother's septic infection during long and difficult labor it will develop characteristic symptoms of this condition after birth. Inspiration pneumonia may be the predominant form of infection. If blood infection be present, fever, rapid pulse, prostration, inability to nurse, dark red fluid discharges from the bowels and petechial skin eruptions, may be present. If the blood be examined the infective germ may be discovered.

Although the child may be born without infection, if the mother develops sepsis the child may share her disease. If the fingers of the nurse are infected, in bathing the child she may infect its mouth, or the stump of the umbilical cord. If the child's head has been bruised and lacerated by forceps, scalp wounds so caused may become infected. The signs and symptoms of this condition are redness, swelling, and tenderness over and about the infected areas with the formation of a purulent secretion, or a crust containing pus cells, fibrin and infective bacteria. If the fingers of the nurse have not been sterile at the birth of the child, and these fingers have been introduced into the mouth to cleanse it, the mouth may become infected. If the child has swallowed infective

bacteria in utero, or infected milk from the mother's breast, enteritis may develop with dark fluid discharges from the bowels. If the milk be infected, the tissues at the umbilical ring will be reddened, swollen and tender, and pus may develop. In the case of severe cranial injuries to the newborn, if the fetal blood be infected and the child survives sufficiently long, meningitis may be the result.

In septic infection developing after the birth of the child the local treatment consists in thoroughly cleansing infected areas with peroxide of hydrogen, and in the use of mild antiseptics, such as boracic acid in ointment or powder. Dressings of sterile gauze should be used and the infected areas frequently irrigated and cleansed. The general treatment consists in the use of stimulants, breast feeding if possible, intestinal irrigation, and a free supply of oxygen or fresh air.

While ordinarily the mother infects the fetus, if the child has derived its infection through the carelessness of the physician or nurse, the child may infect the mother. This is especially true where there are cracks and fissures of the nipple, and where the child's mouth has not been carefully cleansed before and after nursing.

A frequent cause of infection of the mouth and eyes of the infant is rough and careless methods of cleansing at the time of birth. So soon as the head is born the eyelids and orbital regions should be very gently but thoroughly cleansed with soft sterile linen, and a sterile solution of boracic acid. As a prophylactic against the development of eye infection, argyrol or nitrate of silver can be dropped into each eye. In cleansing the mouth boric solution should be employed and a clean finger covered with soft sterile linen dipped in boric solution should be used with the utmost gentleness to cleanse the mouth and remove any mucus, blood, or vaginal secretion, which may have entered the child's mouth during birth.

PART IV

THE NORMAL PUERPERAL PERIOD

CHAPTER XV

THE MOTHER

The puerperal period begins so soon as the fetus and its appendages have been expelled or removed from the uterus. Its essential phenomena are involution of the uterus, whereby it returns to very nearly its original size and shape, the involution and contraction of the pelvic floor, abdominal muscles and other muscles concerned in parturition, the successful establishment of lactation, and the readjustment of the mother's organs of assimilation and digestion, to the conditions altered by the birth of the infant. In other words, the mother during the puerperal period should return very nearly to her condition before impregnation.

INVOLUTION

By the intermittent contraction of its muscle fibres the uterus grows progressively smaller. Immediately after the expulsion of the placenta it relaxes, so that the fundus is usually at the umbilicus. If the uterine sinuses have been normally occluded by thrombi this is not accompanied by bleeding. In normal cases the uterus begins to contract when the child is put to the breast, and lactation and nursing are a powerful stimulus to involution. The rate of involution will depend upon the absence of infection, the mother's ability to nurse the child, and her general vigor. Septic infection delays involution, infective bacteria swarming between muscle bundles, thus choking the lymphatics of the

uterus and preventing its normal circulation. The muscular tissue is softened by the toxins which infective bacteria produce. Thus an index of the success of involution is found in the absence of infection.

Those drugs and remedies which stimulate uterine contraction through direct influence upon the uterine muscle or stimulation of the nervous ganglia of the uterus, favor involution. The normal position of the womb, which permits the free discharge of the lochia, is essential for good involution. Lacerations of the cervix hinder involution because they permit the entrance of bacteria, and may extend sufficiently far to injure the ligaments which keep the womb in normal position.

LOCHIAL DISCHARGE

This is first blood and serum from uterine sinuses and afterward serous fluid containing the debris of the uterine decidua, and later mucous from crypts in the vaginal mucous membrane, and from the cervix. The lochial discharge is sometimes called the bloody, serous and mucous lochia. Its amount varies with the amount of laceration of the uterus and the general condition of the uterine muscle. The color of the lochial discharge and its character may be greatly altered by infection, as is the case with streptococcus infection when the lochial discharge is a thin dark brownish-red and inodorous fluid.

The odor of the lochial discharge depends upon the kind of bacteria which it contains. If staphylococci be present in abundance they are usually accompanied by leukocytes, and the lochial discharge has the characteristic odor of pus. While foul smelling lochia is offensive, it rarely indicates a condition of danger. In the most serious infection, that of streptococcus, the lochial discharge has but little if any odor.

The Cessation of the Lochial Discharge.—This depends upon the amount and degree of laceration of the generative tract present, the degree of uterine and vaginal involution, the establishment of lactation, or the occurrence of infection. When lactation is developing the lochial discharge is greatly diminished and may remain less than normal for from twenty-

four to thirty-six hours. The explanation of this phenomenon is found in the fact that the formation of milk in the breast produces a temporary toxemia. This seems to inhibit the formation and discharge of the lochia and usually causes disturbance in the patient's pulse, temperature and nervous system. As the secretion of milk becomes established the lochial discharge returns.

The lochial discharge of an apparently healthy mother may prove infective to another organism, so physicians and nurses having scratches upon the hands have become infected from attendance upon puerperal patients.

Diagnosis by the Examination of the Lochial Discharge.—An attempt has been made in puerperal septic infection to diagnosticate the kind and severity of the infection by examining the lochia. While it is a comparatively simple matter to isolate streptococci, staphylococci, bacillus coli communis, and other less important germs from the lochial discharge, the presence of these germs does not necessarily prove that the infection is a severe or dangerous one. Patients often give no constitutional sign of infection although germs are found in the lochial discharge.

In pursuing this study, the uterine lochia only should be taken, and every possible precaution be exercised to avoid contamination with the vaginal lochia.

The Treatment of the Lochial Discharge During the Puerperal Period.—Upon the establishment of antisepsis it was thought necessary to wash away the lochial discharge by copious vaginal antiseptic douches. The results of this treatment were disastrous, for bacteria from the vagina were carried by the douche fluid into the uterine cavity and infection was increased rather than lessened. Since vaginal douches have been abandoned the percentage of puerperal mortality and morbidity has been reduced. To receive the lochial discharge antiseptic occlusion dressings should be worn over the vulva. These should be composed of sterile material and there is an advantage in having it soaked in antiseptic fluid. This prevents the growth of bacteria in the dressing and lessens somewhat the patient's chance of local reinfection. Such dressings should be burned after removal, as they become a source of danger if allowed to re-

main long in the patient's room or in the wards of the hospital.

To cleanse the patient from the lochial discharge when the dressings are changed, a copious irrigation by a small pitcher with an antiseptic solution is the most efficient and safe method. Where the lochia is offensive especial care should be exercised to change the dressings frequently and to keep the patient as clean as possible by external douching. If this precaution be taken but little odor, if any, will be perceptible about the patient.

THE INVOLUTION OF THE GENITAL TRACT ASIDE FROM THE UTERUS

The distended tissues of the pelvic floor and perineum and the over-stretched muscles and fascia of the abdomen gradually recover very nearly their previous condition. Patients usually have great faith in a tight bandage to secure contraction of the abdominal muscles. This virtually puts these muscles in splints and it is far inferior to efficient massage and graduated movements. Such may be undertaken after the second week of the puerperal period with great advantage.

Normally the uterus returns to practically its former size, shape and position.

To prevent retroversion in the puerperal period the mother must not lie constantly upon her back, but must turn frequently upon the sides or even upon the abdomen. The rate of uterine involution should be watched during the puerperal period by observing the distance of the fundus from the symphysis pubis. In a primipara the fundus should have reached the pelvic brim in from ten to fourteen days after childbirth. In a multipara the uterus remains permanently enlarged and the fundus correspondingly higher in the abdomen. If there is a tendency to retroversion during the puerperal period the simplest and most efficient method of treatment consists in having the patient lie upon the sides or abdomen, and after the first two weeks in having her assume the knee-chest posture for ten minutes, night and morning. The nurse should open the vulva sufficiently to permit the free entrance of air.

THE RETURN OF THE PATIENT TO HER NORMAL CONDITION OF ASSIMILATION DURING THE PUERPERAL PERIOD

Immediately after birth the mother is too exhausted to take much nourishment and desires rest most of all. She should, if possible, obtain several hours of uninterrupted sleep. When this is over, the child should be put to the breast to stimulate the secretion of milk. Her first desire will be to gratify thirst, when water should be taken freely during the puerperal period. The first food taken should be milk and other nutritious liquids, and the juice of ripe fruit. At labor the intestines are over-distended with fecal matter in the colon and the bowels are often paretic and distended with gas. The bowels should be caused to move thoroughly. In bringing about this result the influence of laxatives and purgatives upon lactation must be remembered. Salines tend to lessen the secretion of milk and to make the tension in the breasts less. Active purgation also diminishes the secretion of milk. The milder laxatives, such as cascara sagrada and compound licorice powder, decrease the secretion of milk very little if any. Castor oil also disturbs lactation very little. Cascara is occasionally observed to cause irritation in the infant's bowels but this disappears upon lessening the dose.

In administering laxatives and purgatives after labor, if the patient has had a copious irrigation just before labor, the second or third day may be chosen as the time to move the bowels. Meanwhile should gas annoy, and distention occur, a high copious enema or saline irrigation will give relief. Should the breasts become excessively distended a compound cathartic pill, followed by a saline, will often lessen mammary tension considerably. If, however, the secretion of milk is scanty the bowels may remain undisturbed until the third day, when a mild laxative should be used to secure a first evacuation. During the puerperal period the patient's bowels should move daily with the mildest efficient laxative and with irrigation if necessary.

As pregnant patients often suffer from hemorrhoids, purgatives may be selected with reference to this condition. These hemorrhoids usually become worse on the fourth or fifth day after labor and may greatly disturb the patient.

Under these conditions warm olive oil should be injected into the bowel before each movement, the region about the anus should be thoroughly but gently cleansed by irrigation with 1 per cent. lysol mixture, and hot or cold applications of 1 per cent. lysol, or lead water and laudanum may be used. If the bowels be moved several days with aloes, strychnia, and belladonna, a good result will be obtained from these remedies.

THE URINE DURING THE PUERPERAL PERIOD

Immediately after labor the urine of the puerperal patient is often highly colored, loaded with urates, and may contain some albumin. As she recovers from the muscular strain of labor the urates and coloring matter disappear from the urine and it becomes practically normal. It is usually contaminated by the lochial discharge, and if it is necessary to examine it, it must be obtained by catheter.

The Functions of the Urinary Bladder.—During the early and the late months of pregnancy patients are usually annoyed by the pressure of the uterus or of the fetal head upon the bladder. Frequent and painful micturition is often a consequence. The bladder may not be completely emptied and may remain in a chronically distended condition. After labor the bruising of the parts caused by parturition frequently make spontaneous micturition impossible. It is generally necessary to catheterize the patient at least once after labor, and often repeatedly. This, however, is attended with some danger, for unless strict antiseptic precautions be observed the catheter may become contaminated with lochial discharge and the bladder may be infected. The catheter should be used as little as possible for this reason. A soft rubber catheter is preferable and this should be freshly sterilized before use. The nurse should sterilize her hands and wear rubber gloves.

The region about the urethra should be irrigated with an antiseptic solution, the catheter lubricated with sterile glycerine or oil, and introduced with the aid of vision. Gentle pressure over the bladder should be made to secure its thorough emptying.

In attempting to secure spontaneous micturition a hot

turpentine stupe over the bladder, and the pouring of warm fluid over the external parts will often assist greatly. If necessary, the patient may be raised in bed for this purpose.

The blood of the puerperal woman is usually normal or shows possibly a slight anemia as lactation develops. Care should be taken that the patient does not become anemic and if she is nursing a vigorous child, it is well to give her arsenic and iron in moderate doses during the puerperal period.

LACTATION

A correct view of lactation cannot be obtained unless it be remembered that the mammary glands are not sexual organs, but are developed from tissue analagous to the sweat glands of the skin. The development of successful lactation depends upon the absence of infection, and the return of the mother to her normal physiological condition. Nervous disturbance has a special influence in preventing lactation, as nervous disturbance inhibits the action of the secretory nerves. The development and filling of the mammary glands themselves depend largely upon the temperament of the mother and her general condition.

In many patients the breasts at labor contain a thin watery fluid called colostrum, which is composed largely of water, partially formed epithelial cells from the acini of the breasts, and the extractive matter. This fluid acts as a laxative upon the infant's intestines. The formation of fully developed breast milk depends largely upon the stimulation of nursing, and this may be imitated with fair success by the use of the breast pump and massage. In cases where for some reason the child cannot nurse for some time after birth, the secretion of milk may still be retained by this means. Under the stimulus of nursing the breasts gradually enlarge until at the second or third day they become full and secrete abundantly. In some patients milk forms very suddenly in the breasts with what is described as a rushing feeling. This may cause such pressure upon the nerves of the breasts as to produce great reflex disturbance in the patient. Considerable rise of temperature, rapid pulse, hysterical manifestations, profuse perspiration, swelling of the lymphatic glands in the axillæ, and sometimes in the neck, are observed. The

fluid first drained from the breast is excessively yellow and composed almost entirely of fat. This gives place upon the third or fourth day to the normal milk, which is a peculiar pearl-white in color. While the early secretion is very rich and fat, the normal breast milk contains from 4 to 6 per cent. of fat, 7 per cent. of lactose or milk sugar, and 1½ to 2½ per cent. of proteid matter. In healthy patients under good conditions no pathogenic bacteria are present in the breast milk; but in those who have not practised cleanliness during preg-

Fig. 112.—Primipara in the puerperal state, with normal breasts and successful lactation.

nancy it is not uncommon to find staphylococci. The quantity secreted varies greatly with different individuals and can only be estimated. It is rarely possible to obtain by the breast pump more than 3 or 4 ounces from a well formed breast which is secreting freely. The child is undoubtedly more successful, and by weighing the child before and after nursing we conclude that the average quantity taken from the breast at each nursing is between 4 and 5 ounces.

The secretion of breast milk may be naturally increased by causing the mother to drink water freely and to take milk

and milk foods. Next in importance are cereals, among which preparations of corn are especially good; and next in value are ripe fruits and green vegetables. Large quantities of meat are not only not useful, but harmful, and alcoholic drinks and strong tea and coffee are objectionable. It is commonly believed that coffee lessens the secretion of milk and that tea increases it, but of this there is no actual proof. The secretion of milk may usually be regulated by the appetite of the child, by causing the child to nurse the breasts alternately and at regular hours. During the first twenty-four hours after birth the child may nurse every four hours by day, and not disturb the mother more than once during the

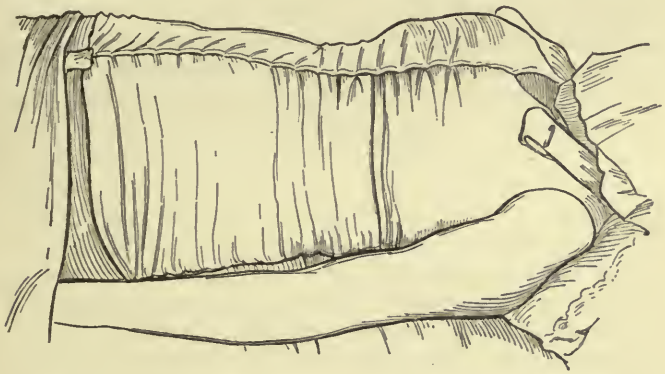

Fig. 113.—Complete aseptic dressings for the puerperal state.

eight hours by night. On the second and third days after birth, three-hour intervals should be observed, and in the average child three hours is more successful than more frequent nursing.

Nursing should be governed by absolute regularity. If the child is slow in thriving it may be nursed more frequently, every two-and-a-half hours. If the mother has not all that is required for the child she need not be disturbed at night, but the child may be artificially fed once during the night.

The Care of the Breasts during Lactation.—To prevent engorgement and stasis of milk, the majority of patients are

benefited by the use of a bandage supporting the breasts smoothly and comfortably. There are various sorts of bandages applicable for this purpose—the breast-binder with shoulder-straps, the double sling bandage, and others.

The nipples should be kept in an aseptic condition by cleansing with a saturated solution of boracic acid before and after the child nurses, and by keeping them covered with sterile gauze and the protecting bandage. The tension of the bandage may be varied in accordance with the fullness of the breasts. There should be several breast bandages available, so that the outer bandage can be frequently washed.

If the nipples are tender, an ointment containing 10 grains of powdered boracic acid to the ounce, will be found a useful application. If there is danger that the nipples may crack, the nipple shield should be used during nursing. Where the secretion of milk is established with difficulty and the breasts are very tense, gentle massage from the border of the breast to the nipple, with warm sterile olive oil, will aid greatly in promoting the patient's comfort. If this be followed by the gentle use of the breast-pump, the tension will be relieved. Massage should never be employed if it causes pain, and hot applications, while occasionally useful, are less beneficial than massage.

Where the nipple is inverted it should be drawn out by the breast pump before the child attempts to nurse. The patient use of this method will usually enable the child to finally draw out the nipple.

The Complications of Lactation.—Where the nipples crack and bleed, especial care must be taken to maintain aseptic precautions. The nipple shield should be used for nursing, and boracic acid solution should be freely applied before and after. Where the cracks are obstinate and slow in healing, the application of nitrate of silver is often useful.

Where the secretion of milk is deficient, massage and gentle pumping before nursing will usually increase the supply. Where the secretion is excessive and rich in fat, the application of the breast pump before the child nurses will remove the richest of the milk and enable the child to take the remainder. Deficient secretion of milk calls for tonics for the mother and a diet rich in milk and milk foods, green vege-

tables, cereals, and cooked fruit. If the milk is thin and poor in quality a moderate quantity of fresh beef, chicken, mutton, lamb, squab or turkey, should be added to the diet. Fresh eggs are also useful where the milk is poor in quality. The abundant use of water is necessary in promoting a proper secretion.

Where the milk is excessive in quantity and rich in quality the patient's diet should be restricted, meat should be omitted, and no excessive quantity of fluid taken. The use of tea or coffee may depend on the patient's tastes.

Should the breasts become hard and painful all manipulation which causes pain should be carefully avoided. The breast pump should be used very gently before nursing, and warm applications with the bandage are often useful. Should an area which is red and tender develop, with some rise in the patient's pulse and temperature, infection has occurred. When this develops the child should not nurse from that breast, the breasts should be supported by a bandage, and a dry ice bag placed over the reddened area. The patient should be given a saline laxative. If the infection does not spread, but subsides, the redness will disappear and the tenderness will gradually subside. If the infection goes on to the formation of pus, the patient's pulse and temperature will indicate infection, there will be bogginess on pressure over the infected area, the skin will be red and somewhat tender, and on examining the blood there may be increased leukocytosis.

Treatment of Breast Abscess.—When a collection of pus is present, incision and drainage are indicated. The incision should always be made parallel with the milk ducts and not transversely to their course. If but one reddened area has developed and there is slight disturbance of pulse and temperature, that area only should be incised. The pus should be freely evacuated, the cavity cleansed with peroxide of hydrogen or 1 per cent. lysol, and drained with iodoform gauze. Daily dressings and irrigation should be practised until the area has closed by granulation. Should infection be extensive in the breasts simple incision will not suffice. The patient must be anesthetized, the breasts thoroughly cleansed, and the point where the most fluctuation is obtained should

be first opened sufficiently to admit the gloved finger. The finger should then be carried in different directions in the breast, and if multiple infection be present the infected areas will break down under the pressure of the finger. With blunt-pointed forceps two good-sized rubber drainage tubes should then be drawn through the breasts obliquely from above downward. These drainage tubes should cross near the nipple. The tubes should be washed with an antiseptic solution forced through them by a piston syringe, and the breasts covered with a copious dressing of antiseptic gauze. Daily irrigation and dressing are required, with the gradual withdrawal of the tubes, until the infection has entirely subsided. In severe and neglected cases, where the breast has become thoroughly riddled with infection, it may be necessary to remove the entire organ.

It is rarely possible for the child to nurse from the other breast if one is severely infected. If, however, the sound breast remains healthy an effort may be made to continue the nursing, taking all precautions to avoid the spread of infection. It is usually safer, however, to abandon lactation if severe infection develops.

The Treatment of the Breasts after the Death of the Infant.—When the death of the infant takes away the natural consumption of the milk, the breasts must be thoroughly cleansed with an antiseptic solution, covered with a thin layer of cotton, and firmly but smoothly bandaged. If there is much pain lead water and laudanum may be applied upon sterile surgeons lint. The breasts should not be disturbed by pumping or massage, the patient should be given an efficient saline purgative, and her diet lessened, and especially the amount of liquids taken. Under this treatment the secretion of milk will speedily subside without difficulty.

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CHAPTER XVI

THE CARE OF THE NORMAL INFANT DURING THE MOTHER'S PUERPERAL PERIOD

During the mother's puerperal period the care of the infant should be conducted with regularity, and it should be carefully guarded from disturbance. Whenever possible the child should not remain in the room with the mother, but in a room sufficiently removed, so that its crying will not disturb the mother. A warm, well ventilated room is desirable, with exposure to sunlight, and one free from dampness.

Soon after birth the child should be thoroughly rubbed with sterile olive oil, and after the mother has received attention, if the child is breathing well, it may be given its first bath. The use of separate sponges or wash cloths for the head and face and the remainder of the body, is indicated. In the presence of epidemic disease, pointing to a contaminated water supply, the water used in bathing the child should have been sterilized by boiling. Care must be taken that during the bath the child does not become chilled, and if possible the child should be before an open fire while the nurse is surrounded by a screen. If the child is feeble or breathes badly, the bath should be omitted until it rallies.

Except in hot weather, wool is the best material for the child's clothing next the skin.

The stump of the umbilical cord should be carefully inspected to see that the ligature is holding and that there is no bleeding. The cord may be dusted with sterile powder consisting of powdered starch, with one part of boracic or salicylic acid to ten of starch. This may be sterilized by baking in an oven. The cord should be dressed with sterile cotton and the dressing maintained in position with an abdominal bandage of thin woolen material. During the first bath the child should be carefully inspected to see that no abnormalities are present and that there is no obstacle to

the discharge of urine and feces. It should be given boiled water as soon as possible.

If the child is fretful and restless the large intestine should be thoroughly irrigated with equal parts of sterile salt solution and boiled water. For the first twenty-four hours after birth the child requires no food, but should have water in small quantities abundantly. So soon as the mother is rested the child should be put to the breast, and every four hours after that, omitting the night.

If the meconium comes away tardily, castor oil followed by irrigation is indicated.

The child's nursery should be well aired at all times, and exposed to the sun in all but the hottest weather. If absolute regularity be observed in the care of the infant, and it is not allowed to be picked up and handled indiscriminately the child will usually develop without difficulty.

Should the mother's milk be slow in forming the infant may be fed upon modified cow's milk or partially digested milk or condensed milk. Where milk does not seem to agree, white of egg water may be given, sweetened with milk sugar. If the mother can ill endure the disturbance of night nursing and the condition of the breasts permits, the child should be fed artificially once or twice during the night, allowing the mother to remain undisturbed. The frequency of nursing should rarely exceed three hours, from six or seven o'clock in the morning until ten or eleven o'clock at night.

The Protection of the Infant from Infection.—The infant may become infected in the mouth, the nose, the stump of the umbilical cord, and the intestine. Where influenza is prevalent this germ may gain access to the child's nose and throat. Occasionally the streptococcus and the diphtheria bacillus attack infants. There is no adequate method of protecting infants from such infection, except to keep from them those persons who are known to be infected.

If the child's mouth be not cleansed from infected material some of the lower forms of bacteria may grow luxuriantly in the mouth, forming whitish patches known as thrush. The gonococcus may also infect the child's mouth, producing characteristic lesions, so the mouth may also be the site of syphilitic infection.

To avoid infection great care should be taken that the child's mouth be cleansed with the least possible violence and disturbance. Small pieces of old, soft linen, sterilized by boiling, should be used to cover the finger, and this should be dipped in a saturated solution of boracic acid. When infection develops, material from the infected area should be taken for bacteriological examination—when a correct diagnosis may be made. If diphtheria be present antitoxin must be given; and if mixed infection has developed vaccines may be used. The infected mouth of the child may in turn infect the mother's breast, if there be cracks or fissures in the nipple. The child may swallow the infected secretions from ulcerating surfaces, and enteritis may be the consequence. In these cases attention must be given to the state of the mouth and the child's intestines should be thoroughly irrigated, so far as possible, with boiled water and sterile salt solution. If feeding be artificial the milk which the child takes should be pasteurized.

Infections in the Umbilical Region.—The tissues about the stump of umbilical cord or the stump itself may become infected from infected dressings or hands. In these cases there is redness and swelling about the umbilicus. Where infection is severe the child soon shows the effects by disturbance of pulse and temperature. Umbilical infection frequently becomes a blood infection, when the child will have great disturbance of pulse and temperature and the signs of a septic condition in the blood. Should the umbilicus become infected and pus form in the subcutaneous tissue, it should be evacuated by incision, and boracic acid or salt solution applied on gauze compresses.

In addition to its milk the child should take whiskey or brandy, well diluted.

Intestinal Infections in the Infant.—If the breast milk be infected and the child nurses, staphylococci and other germs may be found in the child's fecal discharges. Boiled water should be used exclusively for the child's drinking, and anything which enters the child's mouth should be sterile before it is used. The child's intestinal discharges may carry infection, and its diapers should be rinsed in antiseptic solutions and boiled before they are used again.

So far as the direct treatment of intestinal infection in infants is concerned, copious and gentle irrigation of the large bowel with boiled water and salt solution, is our best method of treatment. If the infection be severe a fatal result may follow.

The Care of the Eyes in the Infant.—At the moment of birth a drop of argyrol, from 10 to 20 per cent., should be dropped into each eye, and the eye flushed with boiled water or boracic solution. Care should be taken that the child's nails are trimmed and that it does not wound the eye by inserting the fingers. A bright light should be avoided and also exposure to cold, and severe winds.

Should redness and swelling with a muco-purulent discharge appear in the eyes the physician should be at once notified, and cultures be taken for diagnosis.

CHAPTER XVII

OBSTETRIC ASEPSIS AND ANTISEPSIS

So important is this subject in obstetric practice that especial attention is demanded.

THE PATIENT'S BIRTH CANAL

Infective bacteria have been repeatedly found in the vagina of a perfectly healthy patient. Such bacteria do not gain access to the lymphatics or blood vessels under normal conditions, because the parts are protected by an acid mucous secretion which is germicidal. If repeated examinations wound the mucous membrane bacteria may gain access through these wounds. Under normal conditions vaginal douching is unnecessary and dangerous, because it removes the natural protection of the tissues and subjects the patient to the risk of wounds and lacerations. Where, however, labor is prolonged, the amniotic liquid has been lost and air has entered the vagina, repeated examinations and manipulations have been made, the natural protection of the tissues has been disturbed, and the condition is pathological.

Under these circumstances, before delivery the vagina should be thoroughly irrigated with warm lysol mixture, 1 per cent.

While every effort should be made to allow the internal genital organs to escape contamination the external parts and the skin surrounding them should be cleansed by sterile water and soap, followed by sterile hot water and by an antiseptic solution. The hair should be trimmed closely or shaven. During labor sterile vulvar dressings should be worn and maintained in position by a T-bandage.

Care must be taken that the patient's birth canal does not become infected during preparations for labor. The tub-bath should give place to the shower bath, or that obtained by having the patient stand in a bath-tub while the nurse

pours warm water over her from a pitcher. Care should be taken to use cleanliness after defecation to prevent germs from the intestine entering the vagina.

During prolonged labor, with frequent examinations and manipulations, gentle irrigation with warm lysol, 1 per cent., should precede these procedures. The use of sterile rubber gloves greatly lessens the danger of vaginal infection. Instruments and appliances introduced within the vagina must be surgically sterile. After labor but one copious vaginal irrigation should be used, but none is needed during the puerperal period.

The Uterus.—The uterine cavity should not be entered by hand nor instrument without definite indications. Uterine manipulation must be preceded by copious gentle irrigation of the vagina with lysol 1 per cent. The use of sterile rubber gloves should be invariable for intrauterine manipulations. The exercise of gentleness and caution to avoid wounding the endometrium is also necessary.

In delivery, tears of the cervix should be avoided so far as possible, as they are open doors for the entrance of infection. If during labor intrauterine manipulation has been practised, or if the placenta has been removed by the introduction of the hand, the uterus should be very thoroughly irrigated after labor with lysol 1 per cent., or sterile salt solution, and tamponed with 10 per cent. iodoform gauze. This may be allowed to remain forty-eight hours and then removed, and a second irrigation with lysol given. No more intrauterine manipulation should be practised. The immediate closure of extensive lacerations of the cervix uteri complicating labor is of direct advantage in preventing the development of infection.

Of equal importance with antiseptic precautions is the securing of firm contraction of the uterine muscle after labor. Tonic doses of strychnia and ergot have direct value in preventing septic infection. It is also important that after the uterus has been emptied it should be left in normal position. If the puerperal uterus is relaxed and retroverted the lochial discharge will accumulate and infection develop.

In the conduct of delivery through the vagina, and especially in the third stage of labor, care should be taken not to carry

germs from the vagina into the cervix and into the uterine cavity. While it is theoretically impossible that any labor should be absolutely without the presence of germs, still with care one may prevent infection and secure the proper discharge of the lochia and the contraction of the uterus.

The External Skin.—Many obstetric cases must be delivered by section and there are emergencies where but little time is available for elaborate preparation.

In preparing the skin for incision one must remember the action of the various antiseptics commonly used. Bichloride of mercury, lysol and alcohol act best upon a wet skin. Iodine is efficient upon a dry skin.

For emergency preparation of the abdomen the skin should be scrubbed as thoroughly as possible with sterile gauze and tincture of green soap.

Especial attention should be given to the umbilicus. The hair above the pubes should be shaved or cut close. The external cleansing should extend down upon the thighs and upwards to beneath the breasts. The scrubbing with soap should be followed by the plentiful use of hot sterile water and this by hot bichloride of mercury solution, 1:2000, or lysol 1 per cent., or pure alcohol 95 per cent. If there is to be a slight delay after preparation a copious dressing of sterile gauze should be bandaged upon the abdomen. Just before incision tincture of iodine may be applied upon sterile gauze.

Where ample time is given for preparation, this preparation should be done on the evening preceding the operation, on the following morning, and the iodine applied just before incision.

As has been stated, the vaginal preparation for operation should consist of copious but gentle irrigation with 1 per cent. lysol. We have had good results by irrigation with equal parts of 1 per cent. lysol and tincture of green soap.

The Aseptic Care of the Breasts.—This division of the subject of asepsis and antisepsis has been discussed in the management of the puerperal state.

In caring for the nipples it must be remembered that the epithelia upon them is easily wounded and that methods of cleansing and applying antiseptics must be selected with that knowledge in mind.

In preparing the skin surface of the breasts and the surrounding tissues for operation, the method described in preparing the skin of the abdomen may be employed, omitting the application of iodine.

The Aseptic Care of Wounds and Lacerations Accompanying Delivery.—Abdominal wounds accompanying delivery should receive the same antiseptic and aseptic treatment indicated in other cases. As the abdominal incision is often a long one, and the tissues are relaxed and stretched, especial care must be taken to hold abdominal dressings firmly in place and to support the entire incision. For this purpose broad strips of adhesive plaster fastened two-thirds of the way around the patient's body, and overlapping, make the most efficient dressing. Abdominal wounds should be left thoroughly dry and clean and covered by sterile gauze, and should be disturbed as little as possible during the healing process. If dressings become stained by oozing they must be renewed. Stitches should be retained as long as possible, in view of the length of the incision and the character of the tissues. An accurately fitting belt is necessary to support the abdomen during the latter portion of convalescence.

The Antiseptic Care of Lacerations in the Birth Canal.—Where lacerations of the cervix, anterior and posterior segments of the pelvic floor and perineum, occur, such lacerations should be repaired as soon as possible under antiseptic precautions. If the uterus has been tamponed in these cases the vagina should be cleansed with an antiseptic solution and a vaginal packing of bichloride or sterile gauze should be inserted after operation. Stitches in the anterior and posterior segments of the pelvic floor and the perineum must be cleansed by pouring, from a pitcher or other suitable vessel, a warm lysol mixture of 1 per cent., sterile salt solution or boracic acid, or bichloride solution 1:4000. This should be done whenever the bowels or bladder are emptied, or whenever the vulvar dressing is stained through with discharge. It is unnecessary to introduce a tube within the vagina and lacerated surfaces should not be touched. Copious vulvar dressings of sterile or bichloride gauze with a T-bandage are required.

The Prevention of Infection during the Use of the Catheter or Rectal Tube.—It is of especial importance during this common manipulation that infection should not occur. Before the use of the catheter the parts should be thoroughly cleansed with sterile water, and then with bichloride 1:4000, or lysol 1 per cent. A sterile catheter, lubricated with sterile glycerine or sterile oil, should be taken in the gloved hand, the orifice of the urethra sponged with cotton dipped in bichloride solution, and the catheter gently introduced. Precautions should be taken that the urine does not soil the tissues. When the catheter is to be removed the thumb or finger should be placed over the distal end, and cotton soaked in bichloride solution should be used in sponging the tissues about the urethra. After catheterizing an antiseptic solution should be poured over the tissues about the urethra.

In using the rectal tube there is danger that the contents of the bowel containing the bacillus coli communis may contaminate the wounds and lacerations in the perineum and pelvic floor. To prevent this the vulva should be covered with gauze during intestinal irrigation, or the giving of enemata.

Salt solution may be employed with advantage for irrigation, and the return flow should be guarded to prevent contamination of perineal and vaginal tissues. Should stitches in the perineum or pelvic floor become infected they should at once be removed and the surfaces very thoroughly flushed with lysol 1 per cent.

Pregnant patients sometimes suffer from hemorrhoids and from fissures in the mucous membrane of the bowel. These regions are best guarded from infection by the use of a sterile ointment for hemorrhoids, by irrigation of the intestine with salt solution, and by the application of nitrate of silver.

The general principles of asepsis and antisepsis as applied to the puerperal period require that the puerperal patient should be aseptically dressed, like a surgical patient. The breasts and the vulva require occlusion dressings, while the abdomen needs a splint or supporting dressing to maintain the uterus in its proper position and contraction. The overdistended abdominal muscles require constant support until they have regained, at least in some degree, their normal tone.

THE ASEPTIC AND ANTISEPTIC PREPARATION OF THE HANDS OF DOCTOR AND NURSE

The practical application of antisepsis to the hands of doctor and nurse is necessary, both in the interests of the patient and her attendant. For the patient it removes a frequent and most important cause of septic infection, while it protects the doctor and nurse from specific or septic infection acquired from the patient.

The Hygienic Care of the Hands.—As a matter of precaution doctors and nurses need to keep the hands in the best possible condition. Chapped and abraded surfaces on the skin should be thoroughly cleansed with soap and water, and alcohol applied as an antiseptic or a healing ointment. The nails should be kept short and trimmed whenever they become rough and projecting. "Hang-nails" are exceedingly dangerous to those engaged in obstetric practice, for the skin usually becomes abraded or wounded at that point, and septic infection can gain access. Orange wood sticks should be used for cleaning the nails and for pushing the skin back at the face of the nails. Sharp-pointed, slender scissors, curved on the back, are needed, and a nail-file to keep the nails perfectly smooth. Nail brushes should not be soft nor excessively hard and those of good quality are most efficient and economical for constant use. Unirritating soap should be employed, as castile, and scented soaps are usually inefficient and undesirable. Tincture of green soap, where it agrees with the skin, is an especially valuable preparation.

The Preparation of the Hands for Actual Attendance in Labor.—Two methods of preparing the hands are in common use at the present time. In one the antiseptic selected is bichloride of mercury, in the other lysol. Bichloride of mercury has the advantage of being odorless, readily carried in tablets, and, if properly used, efficient. Lysol is a liquid, has an odor to which some patients object, but is useful as an antiseptic and lubricant. It is usually less severe in its action upon the skin than bichloride of mercury. These two antiseptics have a further and very important influence—that bichloride of mercury is rendered inert by soap, while lysol combines readily with soap.

If bichloride of mercury be selected the hands should first

be cleansed in hot sterile water with a reliable soap and with a nail brush, the hands and forearms being thoroughly scrubbed above the elbows. It is not the length of time employed in scrubbing, but the thoroughness and vigor of the scrubbing which is efficient. Following this scrubbing the hands and forearms should be again scrubbed or rubbed thoroughly with gauze and with sterile hot water so that the soap is removed. While the hands and arms are still wet they should be placed in 1:2000 bichloride of mercury solution, and brushed or rubbed with gauze until all parts have been thoroughly gone over. The hands and forearms may then be dried by a sterile towel and sterile rubber gloves placed upon the hands. The forearms should be covered by a sterile gown which comes to the wrists, the gloves being pulled up over the sleeves of the gown.

During labor the gloved hands should be repeatedly rinsed in bichloride solution and thus kept in a practically sterile condition.

If lysol be used the hands and arms should be scrubbed with soap and water, as in the first instance, thoroughly cleaned in sterile water, and then with 1 per cent. lysol. The gloved hand dipped in lysol is lubricated sufficiently for vaginal examinations and operations.

The Use of the Gloves.—While a careful obstetrician with sound hands can conduct labors successfully without the use of gloves, the risk to the patient and to himself is greater than if gloves are employed. It is true that the gloved hand has a less secure grasp upon the newborn child covered with vernix caseosa, but with practice this objection can be overcome, and if the child be grasped with sterile gauze in the hand the difficulty disappears. In prolonged operations the rubber glove may loosen the epithelia upon the hands and set free bacteria and spores in the deeper layers. There seems to be no practical way of avoiding this difficulty, unless possibly the use of the gloves wet in bichloride solution lessens this danger. If the glove becomes torn or perforated during an operation, blood or secretions from the birth canal may be retained within the torn glove and be a source of some danger. With practice the glove should not obscure the sense of touch for diagnostic purposes. The thinnest and

best quality of gloves should be selected, and the gloves should not be so large as to wrinkle upon the hand. The best gloves bear repeated boiling, and when sterilized should be dried and dusted with aseptic powder.

The Hands in Septic Cases.—In dealing with septic cases suspected of specific taint, especial care must be taken that the gloves are sound and that no puncture or tear of the glove occurs. Gloves employed for these cases when not in use should be kept in a solution of bichloride or lysol. When the case is terminated gloves used about the patient should be burned.

The Treatment of Wounds or Abrasions upon the Hands.—A slight aseptic wound or abrasion should be protected by collodion or an antiseptic dressing, and in the event of labor occurring especial care must be taken in rendering the hands aseptic, and in the use of gloves. With these precautions a slight wound or abrasion which shows no sign of infection is practically not dangerous to the parturient woman. Such an injury is dangerous, however, to the person whose hand is involved, and if the case is a suspicious one it should be, if possible, turned over to someone else. If, however, this cannot be done every precaution should be taken to protect the hand by gloves.

INSTRUMENTS AND APPLIANCES

Nickel-plated instruments are readily kept in good condition by sterilizing them by boiling in 1 per cent. lysol. Although few forceps with rubber handles are now used, if such have been made in the best possible manner the rubber handles will endure repeated boiling in lysol. In cleaning craniotomy instruments or forceps having complicated locks, especial care must be taken to clean screw-threads or any other portion of the instrument where blood or secretions from the birth canal might lodge. A hot solution of bicarbonate of soda and a brush are often useful. Obstetric instruments should be kept in good condition and perfectly plated with nickel, or roughened surfaces may wound the birth canal of the mother during delivery.

Glass tubes employed for irrigation, suture material, and dilating bags, may be sterilized by boiling or under pressure

of heated steam. Boiling is unquestionably the most practical and efficient method. If silk be employed to ligate the umbilical cord it should be of good size and thoroughly boiled and soaked in alcohol before use. Catgut in tubes may be heated by boiling the tubes before use. Silkworm gut is readily sterilized by boiling.

The obstetrician may prefer to sterilize instruments and appliances at the time when they are used or to sterilize them at his convenience in his office, wrap with sterile material, and to take them in a sterile condition to the house of the patient. While the latter method is often convenient, it has the disadvantage that in a long-continued labor it may be necessary to use an instrument or appliance several times. Obviously on each occasion sterilization is necessary, and if the obstetrician has not the appliances at hand for accomplishing this he must improvise a sterilizer with domestic utensils.

If the obstetrician carries a sterilizer with him he can readily sterilize his instruments and appliances as often as necessary, and he has the advantage of having them in sterilized receptacles at the time of delivery. Personally, we have found it convenient to use a nickel-plated or copper double box, one portion fitting over the other, in which instruments and appliances may be carried. Two alcohol lamps and stands accompany the sterilizer. For use, the alcohol lamps and stands are placed in the bottom of an empty bathtub, and instruments, sutures and appliances prepared for use are boiled in the sterilizer with 1 per cent. lysol for half an hour. The upper portion of the box is placed over the lower so that the steam which forms is utilized. This box remains closed until delivery, when the upper empty half may be used for suture and ligature materials, thus avoiding confusion with other instruments. If the lysol solution in which the instruments were boiled is allowed to remain and to cool it furnishes a useful lubricant.

Sterile Linen.—At the moment of delivery the patient's genital tract should be surrounded and protected by sterile linen. Large pads of sterile cheesecloth and cotton are useful, upon which the patient may lie. The abdomen may be covered with a sterile sheet. At the moment of delivery

the limbs should be covered by sterile linen leggings which terminate at the upper extremity in a square of sterile linen sufficiently large to cover the lower abdomen and pubic region. This operating sheet, as it is sometimes called, cannot become disarranged during labor, but completely covers the limbs, abdomen and pubes. It is sterilized in hospital and carried in a sealed package with other appliances.

If the use of the rubber pad is preferred this should be thoroughly cleaned with soap and water and lysol, and may be covered with comfort to the patient by a sterile linen cover.

In addition to those instruments which are strictly obstetrical, two hypodermic syringes in good working order should be invariably at hand for confinement. If the obstetrician is to go some distance from his office, a small metal box containing instruments for performing bleeding and intravenous saline transfusion may be of great value. So the necessary tube and funnel for washing out the stomach and a rectal tube may be urgently needed in complicated cases.

THE PATIENT'S ROOM AND ITS FURNITURE

For confinement and the puerperal period a room in an upper story, well aired and lighted and exposed to the sun in all but the hottest weather, should be selected. A bathroom on the same floor is necessary but it should not immediately adjoin the room of the patient. A separate room for the child and nurse will be of great value. The patient's room if possible should have an open fireplace where a wood fire can be used.

Care should be taken that there has been no infectious illness in the room preceding the patient's confinement, and that curtains and hangings and upholstered furniture, if possible, should be removed before confinement. If an old carpet be nailed down upon the floor that portion of the room occupied by the patient's bed and about it, should be covered by old sterile sheets at the time of confinement. The dust from an old carpet is a source of danger in all surgical procedures. At the time of confinement the nurse will need several medium-sized firm stands, chairs with wooden bot-

toms, an abundant supply of hot and cold boiled water, and a means of heating the room promptly just before the birth of the child.

The patient's bed should be narrow and high and the mattress firm. Good results can often be obtained by raising a single bed upon four cubical wooden blocks, 8 inches in diameter. The bed should stand in such a position that it is easily accessible from all directions. An iron hospital bed is excellent for the purpose, and in a large family may be useful in subsequent illness. The mattress must be protected by impervious material and the bed practically made up double, so that after the confinement soiled linen and protective can be removed, leaving the patient in a clean bed. The blankets used during confinement should not be large or very heavy and should be sterilized if possible before they are used. Small and firm pillows will be found better than the larger and softer variety. A large and firm screen is a great comfort in the puerperal patient's room and is useful for the nurse in caring for the child.

DRESSINGS

While it is not practical to cover the patient completely in sterile garments during labor, still those which are undoubtedly clean must be selected. Old linen should be employed, so that linen garments can be torn if necessary when it is desirable to remove them while the patient is weak.

Obstetrical dressings consist of bandages for the breasts, and an abdominal binder and occlusion dressings for the vulva, which are retained in position by a T-bandage. The breast and abdominal binders and the T-bandage may be made of unbleached muslin which has been sterilized by boiling. Vulvar occlusion dressings may be conveniently made with gauze, enclosing borated or sterile cotton.

Where expense is a great item, cotton padding with a centre portion of picked oakum enclosed in sterile cheesecloth, may be used. It is the duty of the obstetric nurse to visit her patient before confinement and see that dressings are ready, sterilized, wrapped in sterile packages, and suitably labelled and put in a proper receptacle. The character of the dressings will depend considerably upon the patient's

necessity for economy. Efficient dressings can be prepared very cheaply, if such be desired.

THE OBSTETRIC LIST

Obstetricians are accustomed to furnish the patient with a list of articles which should be in readiness before confinement. Such lists differ with the ideas of different obstetricians. The most elaborate lists specify basins and pitchers of granite or other ware, gauze and bandages, and binders, antiseptics, as bichloride tablets or lysol, soap, nail brushes, whiskey or brandy, material for tying the umbilical cord of the child, borated cotton, a preparation of opium, and often strychnia and some preparation of digitalis and of ergot. One or two catheters for the mother's use, a breast-pump, safety-pins, an ointment for the nipples, and scales for weighing the child.

Supplies for the Infant.—It is the part of the obstetrician to see that clothing prepared for the infant is adapted to its needs. Thin woolen shirts, thin woolen abdominal bands and socks, white and flannel slips, linen or muslin dresses, a cap, and wraps for going out of doors, a solution to be used for cleansing the mouth, and one to be dropped into the eyes, sterilized soft old linen for cleaning the mouth and about the eyes, ligature material for tying the umbilical cord, blunt pointed scissors for cutting the cord, medicine droppers, a suitable crib or bassinette, several sponges or wash-cloths, a fresh cake of castile soap, a saturated solution of boracic acid, should all be in readiness.

The room to be occupied by the child and nurse should be sunny and airy, if possible, having an open fire, and in a thoroughly clean, simple and aseptic condition.

Communication with the Obstetrician.—It is of the greatest importance that the obstetric nurse should have convenient means for communicating with the obstetrician at any time. Quick telephone service, if possible, should be procured, but if this cannot be obtained a messenger should be put at her disposal at any time during the confinement.

Hot Water and Heat.—The obstetric nurse should at any time, day or night, be able to regulate the heat of the patient's room and to secure a practically unlimited supply

of hot boiled water. If there has been an epidemic of illness in the neighborhood of an infectious character no water should be used about the patient in any way which has not been thoroughly boiled.

Directions Concerning Confinement.—It is very important that the obstetrician give to the nurse precise directions as to when he is to be summoned, and under what circumstances, when the patient comes into labor. The nurse should be instructed about any special indications which are of importance in a given case, should be told what to look for, and under what conditions to send messages. The family must be impressed with the necessity for sending messages at once.

It is well to have an understanding concerning who is to have access to the confinement room during the patient's labor. In the interests of the patient, the obstetrician, and the nurse, relatives are most useful when absent, but the patient may demand that someone be present during her confinement. The same definite arrangement should obtain between the obstetrician and the nurse regarding visitors during the puerperal period. Many patients are greatly disturbed, and their convalescence retarded, by visitors who insist upon talking with them, and inspecting and disturbing the child. While the duty may be a disagreeable one, it is the part of the obstetrician to protect his patient, with the help of the nurse, from intrusion.

PART V

OBSTETRIC OPERATIONS (OBSTETRIC SURGERY)

As other branches of surgery have advanced and better results have been obtained, so obstetric surgery, by adopting the same methods successful in other branches, shows equally good results.

While it is not the desire of the obstetrician to unduly alarm the patient or her relatives, or to magnify his services, the relatives of patients should be made to understand that obstetric operations are as serious and important as those of other branches of surgery, and that their successful performance demands the same aseptic technique, skilled assistants, anesthesia, and aseptic environment, with the necessary instruments and appliances for meeting complications which make the operations of general surgery safe and successful. Obviously the more difficult and more important obstetric operations must be done in hospital.

Those patients in whom a diagnosis is made during pregnancy of some condition liable to cause complications in labor should go to hospital for confinement. With the increasing number of hospitals, good roads and motor vehicles the most complicated cases can be safely transported.

When, however, the patient must remain at home the obstetrician must establish practically the aseptic technique of the hospital in the patient's house.

To do this, in addition to the patient's nurse, a nurse accustomed to clinical work is most desirable. She will understand sterilizing instruments and appliances and how to prepare the operating table, and the preparation of the patient. A thoroughly competent anesthetizer accustomed

to obstetric work is indispensable. If abdominal section is to be performed, additional assistance will be necessary.

For difficult forceps deliveries, craniotomy, and sections, if the operator does not bring an operating table one must be improvised by taking a kitchen table. This must be washed clean, covered with blankets and then with sterile material.

To hold the patient's limbs in a convenient position a large sheet folded in the longest way should be placed beneath the occiput and over the shoulders, the patient placed upon the back, the thighs and legs completely flexed, and

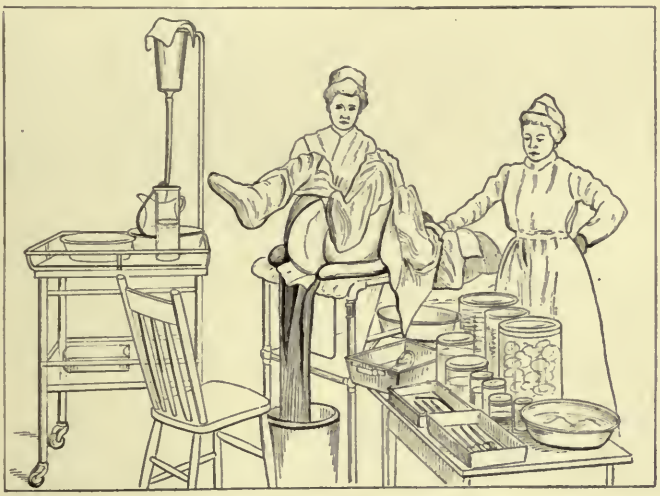

Fig. 114.—Aseptic preparation for an obstetric operation. Vaginal delivery.

the sheet tied around the outer portion of each leg just below the knee. This simple device enables the obstetrician to dispense with the services of those who would hold the patient's limbs.

For operations in private houses the obstetrician must bring with him instruments and appliances, sterilizer, sterile emergency dressings, an operation sheet for covering the limbs and abdomen, operating gowns, gloves, instruments for transfusion, for irrigating the stomach and intestine,

and clean or sterile operating suits. The anesthetizer should be responsible for stimulants and anesthetics.

If there be sufficient time, an operating room may be improvised by removing unnecessary furniture, thoroughly airing and warming the room and covering the floor about the operating table with old sheets sterilized or dried from bichloride solution. During operation the windows should be so screened that neighbors cannot observe what is going on.

In conducting obstetric operations the obstetrician must remember that he assumes grave responsibilities in their performance. Unless in some sudden and dangerous emergency, he is not justified in performing obstetric operations without notifying the husband or nearest relative. While it is unnecessary to go into details, the necessity for operation must be clearly stated, and permission from those responsible for the patient should be obtained. Should operation threaten the life of the child, and the parents' religious belief causes them to desire baptism, some provision must be made for the administration of this rite.

In cases of craniotomy, or the birth of a monster, care must be taken to cover the body of the child and not to permit the mother or other relatives to observe its distressing appearance. In the event of abnormality or a monster the husband or nearest relative of the patient should be shown the child and the condition explained.

When it becomes necessary to transport obstetrical patients to hospital it may often be well to give a hypodermatic injection of morphin and atropin before the patient is placed in the ambulance. Labor pains are sometimes aggravated and the patient suffers much increased pain by the motion of the vehicle. Precautions must be taken to guard obstetric patients from cold and exposure.

In justice to the patient and the profession, obstetric operations must be performed with the same thoroughness and care given to major surgery. The patient and her friends must understand the gravity of these procedures and proper compensation for them should be given to operators, assistants, and nurses.

CHAPTER XVIII

THE FORCEPS

The most common and one of the most important operations of obstetric surgery is the delivery of the child by forceps. It is unnecessary to state the different varieties and modifications of this important instrument. No forceps can be considered satisfactory which is not carefully made, perfectly plated, and so constructed that some device for making axis traction can be attached. Of the many sorts, unquestionably in English speaking countries, the Simpson forceps is most used. As obstetric surgery has improved, the application of forceps to the unengaged head has been abandoned. The elaborate and efficient instrument of Tarnier is rarely used. We have found most efficient Simpson's forceps, made sufficiently long to reach the head and engage in the pelvic brim, and strong enough to enable the maker to perforate the blades for the attachment of tapes for axis traction.

The forceps is composed of three portions: The cephalic extremity which fits on the head, the shank or narrow portion upon which is the lock and the handles. The cephalic portion should be so shaped that it fits accurately over the parietal portion of the fetal head at term. The lock of the forceps should be of the simplest construction so that the instrument can be locked or loosened with the least possible disturbance. The handles should be large enough to permit a firm grasp in a large hand.

Among the many devices for making axis traction the tapes originally proposed by Poulet have been found useful. Good forceps have a proper cephalic curve with the blades so thoroughly made that they will not bend or break, the lock accurately fitted, the handles light and large, and the whole instrument well protected by nickel plating. While a

traction bar is sometimes useful, in many cases it is superfluous.

Where forceps are improperly made the instrument has broken, leaving a portion within the womb, or has bent so that the original curve has been lost. For convenience the handles may be hollow or made largely of aluminum.

The Indications for Delivery by Forceps.—In common with other important obstetric operations, delivery by forceps is indicated when the life or health of the mother or of the child is in danger. *Safe delivery by forceps is only possible where the head is well engaged and has moulded, and is in a position and with a presentation favorable for vaginal delivery.* If the forceps be applied to the head before engagement and moulding, with unfavorable presentation and position, the life of the child is lost, and the life of the mother gravely threatened.

The most common indication for forceps delivery is failure in the mother's expulsive forces, causing delay which threatens the life of the child and the health of the mother. Some observers state that simple inertia of the uterus and muscles of parturition is never a valid cause in itself for forceps extraction. While we may not agree entirely with this, for successful forceps delivery it is necessary that the patient's uterus contract during and after the delivery of the child. If a patient was so exhausted in labor that uterine contractions had absolutely ceased, it would be necessary for the obstetrician to give anodynes and stimulants until the patient's uterus acted before she could be safely delivered.

The child must also be living and in good condition to justify the use of forceps. If the child has died, in many cases the mother can more safely be relieved of the infant by embryotomy. While this is true from the standpoint of science, the mutilation of the child which accompanies embryotomy renders it an operation of horror among patients, and the feelings of a mother would be less shocked if the child was delivered by forceps without mutilation, although dead, than if the dead child had embryotomy and delivery.

It is seldom necessary to explain to the mother the exact nature of the operation to be performed. Her suffering is so great that she welcomes relief by any method which

gives a prospect of success for her and for the child. To responsible relatives, however, a clear statement should be made and such encouraging facts as are available should be stated regarding the outcome of the operation.

In addition to the essential conditions that engagement and moulding must be present, the cervix must be dilated two-thirds. It is desirable that full dilatation be present and the membranes ruptured, but where the necessity for delivery by forceps arises, if two-thirds dilatation be present the remainder can be effected under anesthesia by the gloved hand, the membranes ruptured, and the forceps applied.

It has properly been said that the use of forceps is the most dangerous and deadly operation in obstetric practice. This is true if the operation be done without proper indications and without the conditions necessary for success. It is of absolute importance that the head be well engaged and moulded, for this is a practical demonstration of the fact that the mother's birth canal and the fetus are proportionate in size. Where this essential condition is not present and a mistaken diagnosis is made, the lives of mother and child are in danger.

The Forceps as an Instrument.—While there are many varieties of forceps offered for sale, but few will fill the indications. Good forceps should have a proper cephalic and pelvic curve, should be made of the best steel, well plated, and should have a lock which can easily be closed and opened; and with the forceps should be some simple and practical device for pulling downward and backward in the axis of the birth canal. The forceps should be long enough to insert the cephalic extremity of the blades into the brim of the pelvis, but it is not necessary that the forceps should be introduced above the brim.

Two instruments are typical of the forceps in use at the present day: First is Simpson's, which has a well-marked pelvic and cephalic curve, a lock easily closed and opened, and to which an axis traction device can be attached with but little difficulty. If the forceps be made somewhat heavier than ordinary, and the middle of the cephalic portion of the blades be perforated for the use of strong linen tape, a pull directly downward and backward is obtained

which well fulfils the indications for axis traction. A traction bar through which the tapes may be attached may accompany the instrument, while the operator may grasp the

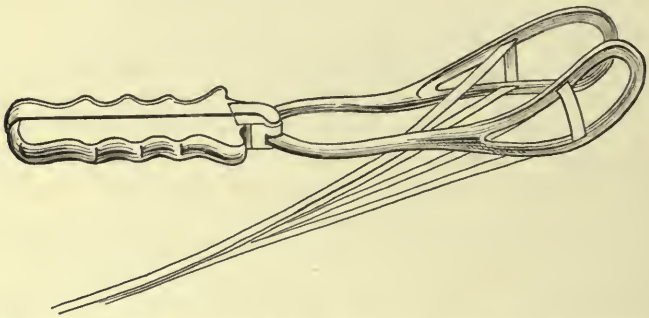

Fig. 115.—Simpson forceps with tapes for making axis traction.

tapes in one hand, holding the instrument by the hand with the other. This forceps is undoubtedly more in use than any other among English speaking physicians. Where it is

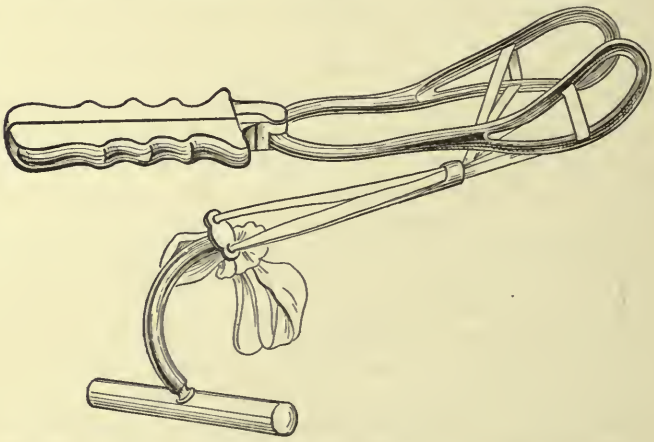

Fig. 116.—Simpson forceps. Axis-traction tapes and traction bar.

desired to use axis traction by clamping the forceps upon the child's head, the Tarnier forceps is best adapted for this pur-

pose. This is longer, heavier, more elaborate in construction, and is adapted for application to the sides of the head, where it is fastened by a lock and binding screw. The forceps and head rotate together as one body, and traction is made downward and backward by steel traction bars attached to a handle with a universal joint.

The Tarnier forceps is especially useful in some cases where the head engages and moulds but does not descend, and where in a primiparous patient the birth canal has not been dilated by previous parturition. If the Tarnier forceps be applied accurately to the sides of the head, the head can be brought down upon the pelvic floor, the forceps then removed, and the head expelled spontaneously; or the forceps retained and the head delivered.

The Simpson forceps is especially useful for cases of transverse position of the head, deficient rotation, a tendency to backward rotation of the occiput or occipito-posterior, and where the head is already upon the pelvic floor. Unquestionably this instrument is useful in the greater proportion of cases requiring forceps delivery.

The Operation of Forceps Delivery.—This obstetric operation cannot be safely and properly done unless the same precautions are taken which are observed in other surgical procedures. When the indications for operation are clear the operator will require an assistant who is not only skilled in giving anesthetics, but who has had obstetric experience and understands the behavior of the uterus in labor. In addition to the nurse who has charge of the patient, a nurse or assistant who takes charge of the instruments, sutures and dressings, is desirable. A sterilizer, the obstetric forceps, hemostats, scissors, needles, suture material, forceps for introducing gauze packing, hypodermatic syringes in good order, iodoform, sterile and bichloride gauze, antiseptics, especially lysol, a sterile fountain syringe with a sterile glass nozzle sufficiently long to irrigate the uterus if necessary, operating suits, gowns, and rubber gloves, and an apparatus for giving an anesthetic, are essential.

A suitable table may usually be improvised in the house of the patient, but some operators prefer to carry an operating table. A room should be chosen, if possible, next the pa-

tient's, where the table may be placed in a good light, with smaller tables for basins, pitchers, and other appliances. A gallon of hot sterile 1 per cent. lysol should be in readiness, and tincture of green soap and lysol or bichloride solution should also be at hand. Sterile gauze or cotton for sponging will be needed.

To retain the patient's limbs in position a sheet folded the longest way should be laid across the table beneath her neck, and when she is anesthetized the limbs should be drawn up upon the abdomen, the ends of the sheet passed over the shoulders and tied firmly on the outer side of each leg below the knee. This rotates the legs and thighs outward. The patient may be anesthetized in her bed, ether being the anesthetic of choice, and may then be lifted upon the table in the adjoining room. When the limbs are in position by the sheet, the patient should be catheterized under anesthesia and with antiseptic precautions. The hair about the external genitals should be closely trimmed with scissors, the external parts thoroughly cleansed with tincture of green soap and water, followed by flushing with sterile hot water and then with bichloride solution 1:4000. A copious but gentle vaginal irrigation of 1 per cent. lysol should be given.

The nurse in charge of the patient may assist in holding the limbs steadily and should be in readiness to receive the child and to care for it. The instruments employed, in charge of the other nurse or assistant, should be placed conveniently for the operator. Anesthesia should be at first surgical anesthesia, and before applying the forceps the operator should make a thorough examination with the gloved hand to determine the exact position of the presenting part. Having found that engagement and moulding are present and having mapped out the head, the left blade of the forceps with its axis traction attachment should then be taken in the left hand of the operator, and the right hand inserted up to the thumb, which acts as a guard. A common mistake consists in inserting but one or two fingers, so that the forceps blade is introduced more or less blindly, and in unskilful hands may be thrust through the vagina and into the pelvic or abdominal cavity.

Care should be taken that the membranes have ruptured

and that the forceps is applied directly to the fetal head. If dilatation is not perfectly complete it is well to pass the gloved hand around the entire cervix, stretching it gently but thoroughly. The left blade of the forceps is passed along the right as a guard and is applied as accurately as possible over the parietal portion of the head. Should the face be presenting, the forceps is applied over the sides of the head and face. Should the breech be presenting, the forceps is applied over the trochanteric region.

It is well to notice the position which the forceps blade takes after application, as this is a valuable index of the position of the head. The right blade is then taken in the right

Fig. 117.—Forceps applied to the sides of the child's head.

hand of the operator, the left hand introduced as a guide, and the blade passed along the hand and on the side of the head. It is gently and slowly moved until it comes in relation with the other part, so that locking easily is possible. It may be necessary to slightly move both blades of the forceps before this can safely be done. Under no circumstances should the forceps be brought with great force together, and if the instrument does not readily lock the application is an improper and unsafe one.

Before making traction the operator must satisfy himself by examination that nothing but the fetal head is in the grasp of the forceps. Occasionally the cervix is caught

in such a manner as to lacerate it, and other injuries are sometimes inflicted upon the mother's soft tissues. When it is found that the application is correct the axis traction attachment is brought into proper position.

In using the Simpson forceps with tapes, a finger of the operator may be placed between the distal extremities of the blades at the handles. As the operator pulls the pressure of the handles upon the finger will give some indication of the pressure exerted by the instrument upon the child's head. In this manner injurious pressure may often be avoided.

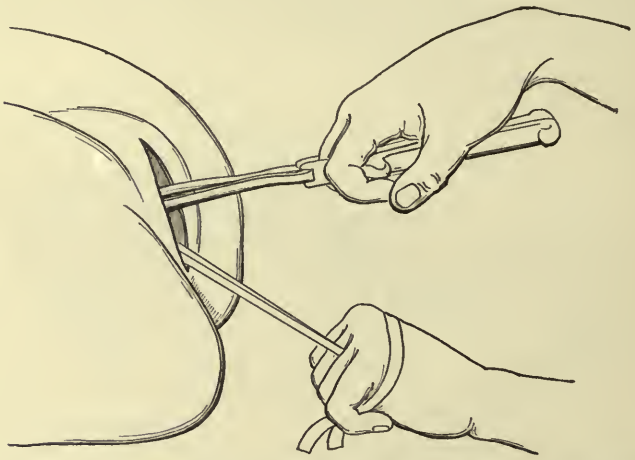

Fig. 118.—Axis traction with Simpson forceps and tape attachment.

This is especially valuable in cases where by reason of the abnormal position of the head the blades have not been accurately applied to the sides of the head, and where traction must be made, and the head allowed to rotate in the forceps blades between the tractions.

Delivery by Forceps.—The forceps is designed to supplement the forces of labor, and to do this properly the uterus must be made to act while the forceps is making traction.

The assistant who is anesthetizing the patient should rub the uterus and excite uterine contractions just before the operator makes his traction. The uterus is thus stimulated

to follow the head down, and the tendency to relaxation and hemorrhage is much less. Traction should be made with the arms only, without pulling or bracing, and by the axis traction attachment the direction of the pull should be downward and backward. In cases of deficient rotation the position of the instrument will serve as an index to the movement of the head. After a reasonable traction has been made the operator should desist and loosen the grasp of the forceps. Traction should be repeated at intervals of a few minutes.

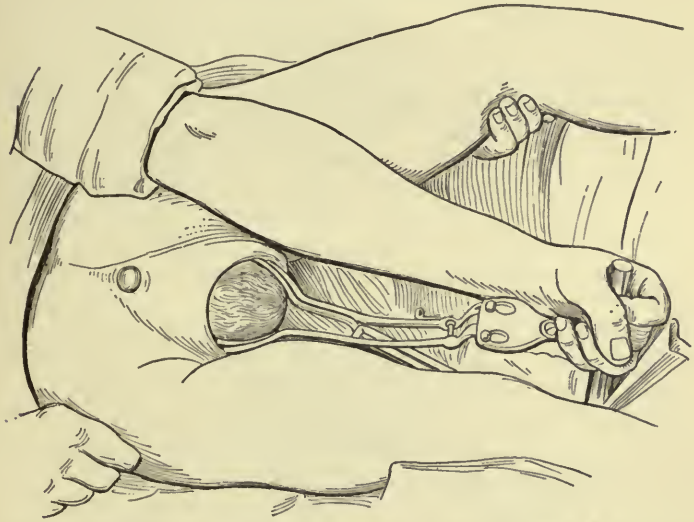

Fig. 119.—Patient delivered in left lateral posture with axis-traction forceps.

always supplemented by contraction of the uterus, until the head has rotated and the occiput appears beneath the pubes.

While some advise at this stage that the instrument be removed and the patient allowed to become conscious and deliver herself it is usually better to proceed and to complete the delivery. When the head is well upon the pelvic floor with the occiput under the pubes axis traction is not needed. If tapes have been used they may be dropped or cut, and if

the Tarnier forceps has been used the traction bar should be removed and the traction rods brought up under the blades.

To deliver the head over the perineum and pelvic floor with the forceps the operator must prepare to support the pelvic floor to some extent and to guard against contamination of the birth canal from bacteria and fecal matter from the bowels. To accomplish this the perineum should be

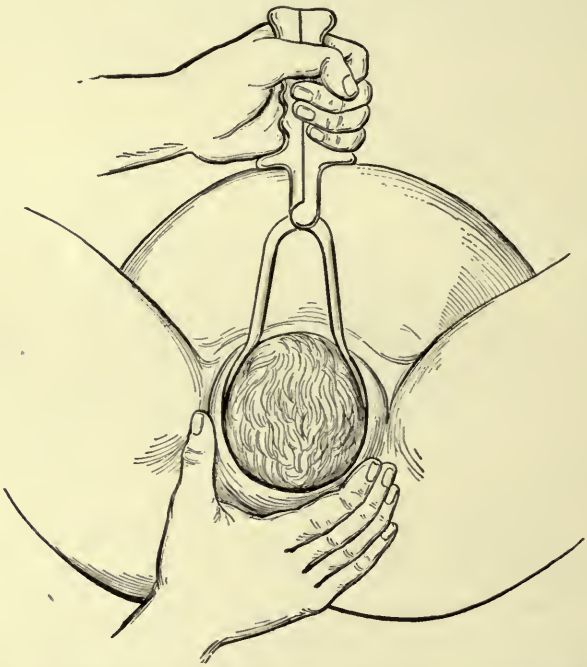

Fig. 120.—The protection of the pelvic floor during forceps delivery.

thoroughly cleansed with warm bichloride or lysol, and a large pad of gauze wrung out of bichloride or lysol should be placed over the anus. With successive and gentle tractions the occiput should be brought well under the pubes with the forceps grasped in one hand, while with the other placed upon the pad of gauze, the perineum and pelvic floor should be stretched backward over the head. With a few tractions it

will be possible in this manner to deliver the head over the perineum and pelvic floor. When the head has been delivered the forceps is removed and the remainder of the delivery accomplished as in normal cases.

After the child is delivered the operator must use his judgment, and in almost all cases it is possible to allow the patient to become at least partially conscious and to secure good uterine contractions for the delivery of the placenta. This should be aided by Créde's method of expression.

It is well to keep the patient partially anesthetized as it may be necessary to take stitches, when she must be under complete control. After the placenta, membranes and cord have been delivered, if the labor has been long, with repeated examinations and the forceps introduced within the cervix and in the pelvic brim, it is well to thoroughly irrigate the uterus with hot 1 per cent. lysol.

To avoid relaxation and hemorrhage and infection, the uterus may be tamponed to advantage with 10 per cent. iodoform gauze. The cervix should then be drawn down by tenaculum forceps, and examined to determine lacerations. If such be present they should immediately be closed with No. 2 chromicized, iodized or sterile catgut. Both segments of the pelvic floor should then be examined and lacerations immediately repaired. The closure of any lacerations in the perineum and the tamponing of the vagina with moderate firmness by bichloride gauze completes the operation.

The Forceps in Abnormal Rotation of the Occiput.—This is one of the most troublesome conditions which the obstetrician has to encounter, and one in which the forceps is often used. Resort should not be had to the forceps until a reasonable effort has been made to cause anterior rotation. The patient should be placed upon the side toward which the back is pointing, the urinary bladder emptied if necessary by catheter, and tonic doses of strychnia given to secure efficient uterine contractions.

The action of pituitrin is too violent and brief for this purpose. A small quantity of brandy and aromatic spirits of ammonia may be given by the mouth. In many cases uterine contractions are stimulated and anterior spontaneous rotation results. When this fails, and the indications point

to delivery, the position of the back must be carefully ascertained. Whenever possible forceps should be applied to the sides of the child's head, although the head may be standing transversely in the pelvic brim or in the cavity. By using axis traction, in the majority of cases the head will be brought to the pelvic floor and thence will rotate in a normal manner. Occasionally reverse rotation into the hollow of the sacrum results.

It occasionally happens that the forceps cannot be applied accurately upon the sides of the child's head. A Simpson forceps may then be applied along the sides of the pelvis in the pelvic axis, grasping the head in the best manner possible. Traction should be made with care and the grasp of the forceps relaxed between each traction. The head should be brought to the pelvic floor, when it will often rotate within the forceps blades, the occiput coming in front.

Rotation by the Forceps.—Some prefer in these cases to apply the narrowest solid bladed forceps to the sides of the head and with this instrument to rotate the head until the occiput is in front. The forceps is then removed, and if necessary re-applied. In the hands of expert operators this procedure is justifiable, but it is not one to be undertaken without especial skill and training.

The Forceps to the Posterior Occiput.—When the occiput is turned directly behind in the hollow of the sacrum and the head is firmly down upon the pelvic floor, it may be impossible to rotate the occiput in front. It must then be delivered posteriorly—a matter often difficult, and resulting inevitably in laceration to the patient.

To deliver the head in this position, the forceps is applied to the sides of the head and axis traction is made. The Simpson forceps, with tapes, attached to the middle of the cephalic portion of the blades has proved its superiority in these cases, because the traction is applied opposite the centre of the fetal head, and complete flexion is procured. Unless this be present, if the head becomes partly extended, impaction of the head and serious injury to the mother may result.

With the occiput behind, the head is brought by intermittent traction firmly upon the pelvic floor, until the fore-

head begins to be visible beneath the pubes. The occiput distends the perineum and pelvic floor to the utmost, and if serious laceration be present double episiotomy is indicated. When the forehead can be made to pivot beneath the pubes the grasp of the forehead is relaxed and the handles are carried backward in the cephalic portions of the blades, slightly toward the pubes. A new grasp is then taken, and with this, while the forehead bears against the sub-pubic ligament, the occiput is lifted as gently as possible over the pelvic floor.

Fig. 121.—Posterior rotation of the occiput. Delivery by forceps to the sides of the child's head.

During this procedure the anus should be thoroughly covered by gauze wrung out of an antiseptic solution.

As has been stated, laceration is inevitable in these cases, but may be lessened by having strong flexion made as the head comes down, by complete anesthesia at the moment of delivery and by episiotomy.

Lacerations extending to the bowel are not uncommon in these cases, but with good management the lacerations should rarely open into the bowel. The child's forehead and face may be bruised because of the pressure beneath the pubes.

The Forceps in Face Presentation.—In face presentation, when descent is delayed, the forceps may be applied to the sides of the head and face. With axis traction complete extension will be obtained, and the operator must so guide the head as to bring the chin in front beneath the pubes. The delivery of the occiput over the perineum is done by causing the head to flex strongly.

The Forceps in Breech Presentation.—In breech presentation, when descent is delayed, if the forceps is used the in-

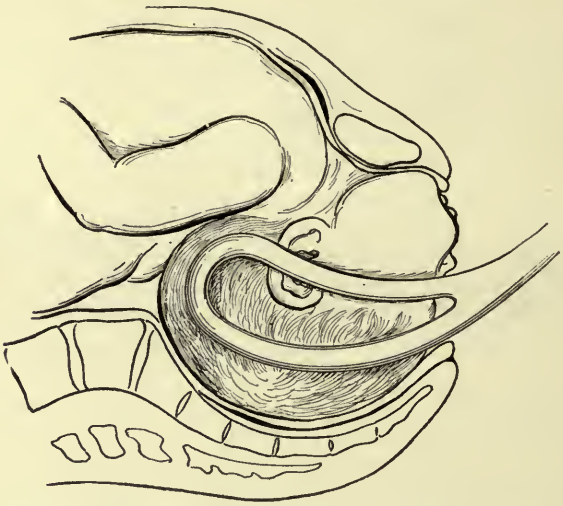

Fig. 122.—The use of the forceps in face presentation.

strument must be applied over the trochanters and traction made in the axis of the pelvis. The operator usually prefers to remove the forceps so soon as the breech is upon the pelvic floor, because the breech and legs can be manipulated more readily with the hand than with the forceps.

Improper Application of the Forceps.—The forceps must not be applied to the hydrocephalic head, nor to the head with the chin pointing in the hollow of the sacrum, nor to the head in brow presentation, nor in parietal bone presentation. In none of these cases will the instrument produce

satisfactory results, but will injure the mother, and will complicate her recovery.

The most common and dangerous error in the use of forceps is the failure to diagnosticate the absence of engagement and the failure of moulding. Because the head has been

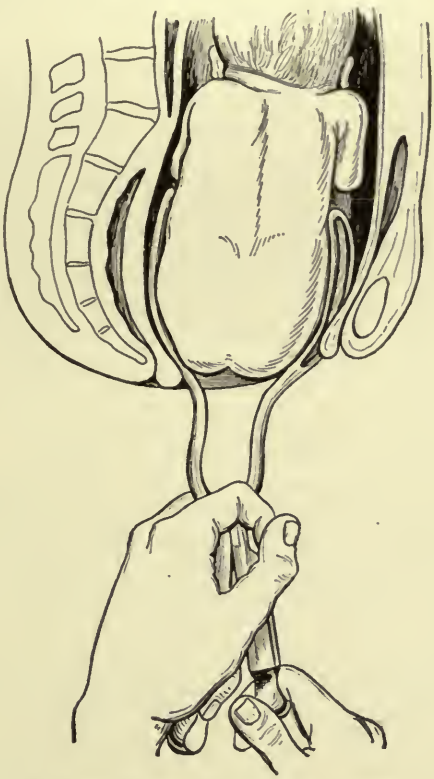

Fig. 123.—Forceps applied to the breech.

forced into the upper pelvis and has become impacted in the brim, this must not be considered as engagement. There is no moulding in these cases and usually the head turns transversely. There is increased lateral obliquity and the presentation of a parietal bone results.

Repeated Application of the Forceps.—Some obstetricians think well of repeated application of the forceps in delayed labor. They would bring the head upon the pelvic floor and then remove the instrument, and should normal expulsive force not develop, again apply the forceps for delivery.

This is objectionable, because it exposes the patient to the risk of repeated introduction of the forceps, with repeated examination and manipulation.

The Successful Application of the Forceps.—If the forceps has been properly applied and the operator makes judicious traction, and the forceps slips, he may make a thorough examination to be sure that he understands the position of the head, and must try to shift the forceps slightly to obtain an accurate grasp. If on repeated traction the instrument slips the forceps must be removed and the attempt made to deliver by forceps must be abandoned.

In some cases of disproportion between mother and child, where the head is engaged but not moulded, some operators permit a tentative traction with forceps, to observe whether the head will descend in the pelvic cavity. This should be made with great gentleness and patience, and unless descent follows the attempt should be abandoned.

In some cases of abnormal rotation of the occiput it may be impossible to grasp the head in a satisfactory manner with the forceps. In these cases the operator may often fall back upon internal podalic version, which will inevitably bring about a position of the body and head more favorable to the child.

In performing this operation especial care must be taken that the patient be completely anesthetized during version. An unsuccessful attempt to deliver will have stimulated contractions of the uterus, and produce a condition of partial spasm, where rupture of the uterus might readily occur.

Accidents and Injuries Caused by Forceps.—In the experience of the writer cases have been seen where the blade has been broken off and the cephalic portion left within the uterus. The forceps has been forced through the uterus into the pelvic and peritoneal cavities. The forceps has grasped a portion of the cervix and torn it away, causing free hemor-

rhage. The forceps has also torn the uterus so that after the delivery of the child and its appendages the intestine has prolapsed. Traction by the forceps has been so violent and ill-directed that the pubic joint has been separated and the sacro-iliac joints have been strained. The child has been killed by fracture of the skull, and in one case blindness resulted from pressure of the forceps blade upon the eye. Bruises, lacerations and wounds of the scalp, cranial periosteum and cranial bones, lacerations of the membranes surrounding the brain, rupture of the middle meningeal artery, followed by hemorrhage, and pressure upon the head producing dropsy of the ventricles—have all been observed. Severe hemorrhage following laceration of the cervix, because delivery was attempted before dilatation was complete, is not infrequent. Extensive lacerations of the cervix, the pelvic floor and perineum, may accompany forceps delivery.

With this chapter of accidents which have been observed in the experience of one person, goes the prostrating effect of hemorrhage, of lacerations of the birth canal, and the added complication of septic infection.

Where difficult forceps operations are attempted in tenements and other unfavorable surroundings, septic infection is almost inevitable.

The mistake is sometimes made of applying forceps in doubtful cases of disproportion, with the idea that, if the head could not be brought through the birth canal, the pressure of the forceps would virtually do a craniotomy. This is an unfortunate mistake, for if pressure by forceps is sufficiently violent to kill the child it will fracture the cranial bones, and pieces of the bone may be forced through the scalp and wound the mother. Where there is grave doubt concerning the possibility of delivery by forceps, it is far better to perform craniotomy than to persist in violent and protracted efforts at forceps delivery.

The Prevention of Shock and Hemorrhage.—So soon as the fetus has been delivered the patient should receive a hypodermatic injection of $\frac{1}{30}$ grain of strychnia and $\frac{1}{150}$ grain of atropin, with one syringeful of an aseptic preparation of ergot. This will prevent relaxation and bring about the prompt separation of the placenta. At the conclusion of the

operation this stimulation should be repeated hypodermatically. After delivery the strychnia and ergot may be given by the mouth for a week or ten days to ensure good involution.

The gauze packing should be removed in forty-eight hours and the uterus gently but thoroughly irrigated with 1 per cent. lysol. No further douching should be employed. The stitches may be cleaned by pouring upon them an antiseptic solution from a pitcher.

The Care of Cases Having Severe Lacerations.—If labor has been long and exhausting and the conditions are unfavorable for immediate suture, the operator may delay the closure of lacerations for twenty-four hours. When a patient has fully reacted from labor she may be anesthetized with ether and all lacerations repaired. The packing of the uterus should not be deferred, however, but should be done immediately.

In lacerations through the sphincter or into the bowel, if the rectal tissues be extensively torn it may be well to inhibit the action of the bowels for a few days after delivery by giving opium. It is usually better, however, to move the bowels promptly with compound licorice powder in small, but repeated doses, to secure the evacuation of thoroughly soft feces.

The patient will require the use of the catheter for a short time, but this should be discontinued as soon as possible. Before and after micturition the parts should be thoroughly flushed with 1 per cent. lysol.

The Maternal Mortality and Morbidity of the Forceps.—This is impossible to estimate for all classes of operators, because so much depends upon the skill and judgment of the operator. In good hands, delivery by forceps has a very small maternal mortality, and this results from occasional death by heart clot, exhaustion, or infection. In the hands of unskilled and dirty operators the mortality of difficult or complicated forceps deliveries rises to 20 and 30 per cent.

The morbidity following the use of forceps depends upon the skilful and judicious use of the instrument. Where the head is grasped before moulding has occurred and forceps delivery is made, extensive laceration must result.

While infection may be escaped under skilful antiseptic care, the patient's recovery to health will be retarded.

The morbidity following the use of forceps is greatly lessened or increased, as lacerations are promptly and properly repaired. Where this work is done thoroughly and immediately the morbidity rate of forceps cases sinks to almost nothing. But where this important element is neglected, infection of varying degree is common, and the anatomical results are disastrous.

The Effect of Forceps Delivery upon the Child.—It has been proven by careful observation that the proper use of forceps not only does not add to fetal mortality and morbidity, but distinctly prevents them. In delayed labor the greatest danger to the fetus arises from birth pressure, and this is removed by proper forceps delivery. Where, however, the forceps is applied to the head before engagement and moulding has been satisfactorily accomplished, or without reference to the position of the head, or direction of the pelvic axis, injury to the fetus is unavoidable. Such injury consists in bruises upon the scalp and face, lacerations of the soft parts, depressions in cranial bones, bruising and wounding of the periosteum, and in some instances actual fracture of the cranial bones and wounds of the blood-vessels. The less severe forms of bruises and lacerations of the scalp require cleaning with boracic solution. Depressed fractures of the cranial bones, if pronounced and over important areas, should be treated by immediate elevation of a bone. Where fracture occurs about the base of the skull with laceration of cerebral vessels, treatment is unavailing.

The effort is sometimes made to connect mental and nervous diseases with injuries received by forceps during birth. Unless labor has been unusually difficult, and the forceps has been unskilfully used, it is much more likely that cerebral lesions have resulted from birth pressure before the application of forceps and that the instrument itself has not caused the trouble. In some cases congenital malformations are present which are accompanied by congenital lesions of the nervous system.

The Field for the Use of Forceps.—With improvements in obstetric surgery and the successful performance of Cesarean

section, there is no longer excuse for the improper use of the obstetric forceps. The application of the forceps before engagement and moulding should be abandoned.

In contracted pelvis especial caution must be exercised that impaction of the head in the brim, with presentation of the parietal bone, is not mistaken for normal engagement and moulding. Caution must also be observed in cases where there is doubt concerning delivery through the vagina, but the forceps should not be applied, and delivery by section selected, before forceps applications have been made.

It is impossible to apply the forceps and make tentative traction without doing some injury, however slight, and without introducing bacteria from the vagina into the cervix or uterine cavity. Again, in some cases where the child is in bad condition, and probably dying, if the fetus is impacted and the position not favorable for easy forceps delivery, craniotomy should be selected.

Some operators prefer to precede the application of forceps in moderately contracted pelves by the application of the pubiotomy saw. With the forceps in position, traction is very carefully made with the hope of securing descent. If this fails, the pubes is severed without removing the forceps, and the head is delivered through the vagina by the instrument.

While this method may be successful in hospitals and in skilled hands, it should not be attempted in private houses.

CHAPTER XIX

VERSION

By version is understood the turning of the fetus in the uterus so that its long axis corresponds with the long axis of the birth canal. Version is of three varieties—external, combined and internal version.

External Version.—By external manipulation the endeavor is made to turn the fetus, situated transversely across the pelvis, so that the head or the breech may descend into the pelvis. This operation is indicated in transverse positions, in brow and parietal bone presentations, and in anomalous positions of the fetus, where spontaneous descent into the pelvis is impossible.

To perform this successfully the membranes must be unruptured, or have but recently ruptured, the uterus must be relaxed and dilatable, and the mother and child must be in good condition. If the membranes have been ruptured for some time, and the amniotic liquid has escaped, there is danger of uterine rupture, as the uterus may contract tightly upon the child. Occasionally in multiparæ whose tissues are greatly relaxed, or primiparæ who are ill-developed and relaxed, the uterus is so dilatable that version by this method is possible.

To perform the operation the position of the fetus must first be clearly outlined by palpation and auscultation. As a cold hand placed upon the patient's abdomen may excite contractions of the abdominal muscles, the hands of the operator must be thoroughly warmed. If the patient is excitable and nervous, anesthesia may be necessary. As brief anesthesia only is required, chloride of ethyl or carbon-dioxid, when available, may be used.

The patient is placed upon a table with the thighs and legs flexed to relax the abdominal muscles. The urinary

bladder should be emptied by catheter. The operator must decide from the location of the fetus whether he proposes to bring the breech or the head to the pelvic brim. Standing with his back toward the patient's head, or, if he prefers, facing her, with both hands by gentle intermittent pressure and manipulation, he carries one end of the fetal body upward, the other downward. Between the manipulations he holds gently but firmly the changed position which

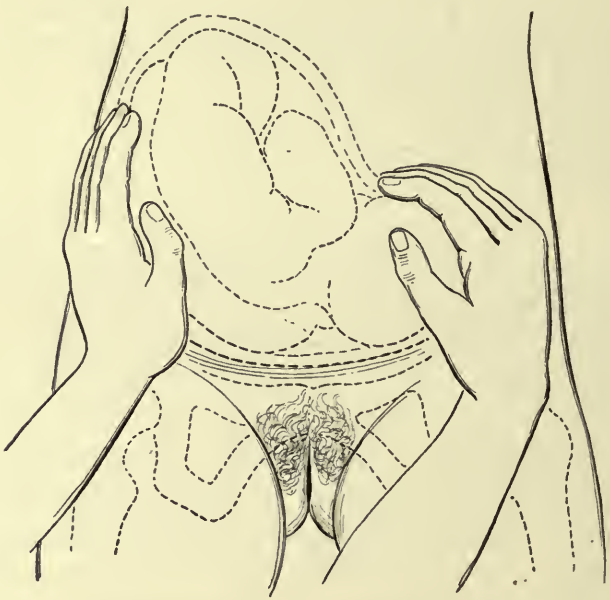

Fig. 124.—Version by external manipulation.

he has produced. When the part selected is brought to the pelvic brim he endeavors to secure its entrance into the brim if possible by subpubic pressure. If the membranes are unruptured and the patient is a multipara, the rupture of the membranes will cause the uterus to contract upon the fetus and to hold it in the desired position. If it is not thought advisable to rupture the membranes a large firm pad may be placed along the patient's

abdomen against the abdominal surface of the fetus in the uterus. A binder should then be applied, with the hope that this pressure will prevent the fetus from resuming its former abnormal position.

External version does not expose the patient to the dangers of infection which accompany vaginal manipulation. The conditions which are necessary for its favorable performance are not often present, but in a few cases the procedure is of value, and may avoid the necessity of internal version.

Combined Version.—By this method several fingers of one hand are introduced within the vagina and cervix to press the presenting part of the fetus up and out of the pelvic brim, while the other hand, applied externally, gradually turns the fetus into such a position that the internal fingers can grasp a foot. This procedure is commonly known as the Braxton-Hicks method.

The principal indication for combined version is placenta prævia. Occasionally it is employed to correct an unfavorable presentation and position, and rarely to dislodge an impacted shoulder and bring about extraction by the feet and breech. This method may be employed in placenta prævia in the earlier months of gestation as well as at term.

If the patient be a multipara with dilated birth canal, and if she be not excitable, this procedure may sometimes be carried out without anesthesia. If the patient be a primipara, or if she is sensitive to manipulation, anesthesia is necessary. Surgical anesthesia with ether will be required, while actual manipulation is performed.

For this operation the patient is placed upon her back at the edge of a table or bed, with the thighs and legs flexed and supported by a sheet or by assistants. The urinary bladder must be emptied thoroughly by catheter and a vaginal irrigation of 1 per cent. lysol given. The operator observes antiseptic precautions, and if he is accustomed to work with rubber gloves he should use them. If he has not had experience in the use of gloves he should prepare the hands with unusual caution and dispense with gloves. Choosing whichever hand he prefers, the hand is introduced slowly and gradually into the vagina, dilating the vagina during its intro-

duction. It is usually necessary to introduce the greater portion of the hand. Seeking the cervix two or three fingers are then introduced, and the head—the presenting part—is pushed up gently and away from the os. While this is done the external hand pushes the breech upward and toward the side opposite to that toward which the internal fingers raise the head. Thus, if the operator with the internal fingers pushes the head upward and toward the patient's left side with the external hand, the breech is carried upward across and downward toward the right side. As the head leaves the os the internal fingers are carried upward and to the right, and if the membranes are unruptured they should be torn asunder. As the breech passes toward the right a foot will prolapse, and this should be grasped by the internal fingers and slowly and gently drawn downward bringing the breech into the pelvic cavity. The foot should be brought through the cervix and into the vagina, and to it should be attached a noose of sterile gauze bandage material.

The operation should cease at this point, for this method is not intended for the delivery of the fetus.

In central placenta prævia the internal os being entirely covered by placenta, the operator must enter the fetal sac by tearing through the placental substance. This will cause hemorrhage, until the foot has been reached, and the hemorrhage is checked by the pressure of the fetus against the placental tissue.

Obviously the performance of this operation is most difficult in cases where the membranes have long been ruptured and the amniotic liquid has in large part escaped. It is most valuable in hemorrhage from placenta prævia, as it controls the bleeding by using the fetal body as a tampon. Its performance exposes the patient to the danger of uterine rupture, hemorrhage from separation of the placenta, and infection, but it remains the best method of treatment for central placenta prævia, if the patient cannot be transported to hospital and given the advantage of abdominal section. It must, however, be remembered that extraction is not intended in the performance of this operation, and that its purpose is to check hemorrhage at the expense of the fetal life.

Internal Version.—This operation is often called internal podalic version because ordinarily the feet of the child are sought and brought down.

Indications.—The indications for internal podalic version are transverse position shoulder presentation, brow and parietal bone presentation, prolapse of the umbilical cord, anomalous position of the head where the forceps slip when applied and forceps delivery is dangerous.

Prophylactic version is sometimes performed in flat pelvis where it is desired to bring the fetus through with the bifrontal diameter of the fetal head in relation with the shortened antero-posterior diameter of the pelvic brim.

Contraindications.—Internal version is prohibited where the uterus is tightly contracted upon the fetus, the membranes having ruptured and the amniotic liquid escaped. In such cases the operation may rupture the uterus and cause the death of the patient.

It is also contraindicated in highly contracted pelves, and to be successful the internal antero-posterior diameter of the pelvic brim must be not less than 9 cm., and it is contraindicated where the fetus is of unusual size and development, where a monstrosity is present, or where a tumor blocks the birth canal.

The Choice of an Anesthetic.—During the performance of internal version it is desirable to relax the uterine muscle as much as possible. To accomplish this the operator has the choice of carrying anesthesia with ether to the complete stage of relaxation, or of employing chloroform well diluted with oxygen or with air.

Position of the Patient.—For this operation the patient is placed upon the back on a high bed or table, at the edge. The limbs are supported by a sheet or by assistants and are flexed and the knees rotated outward. The urinary bladder is emptied completely by catheter, the external parts thoroughly cleansed with antiseptics, and a vaginal irrigation of 1 per cent. lysol is given.

The operator must know the position of the child as accurately as possible by palpation and auscultation. He should have in readiness the obstetric forceps, instruments for closing lacerations and for introducing gauze packing.

Antiseptic precautions should be thoroughly carried out. Rubber gloves should be used and the entire arms of the operator covered with sterile material. Some prefer to use for this operation the long rubber gauntlet.

The Performance of the Operation.—Having outlined the fetus the operator introduces that hand which is opposite

Fig. 125.—Introduction of the left hand to grasp the anterior foot for version (after Liepmann).

the fetal breech and lower extremities. The back of the hand is lubricated before it is introduced within the vagina, the entire hand folded as small as possible, and the vagina gradually dilated by the hand as it is introduced. The hand is carried into the cervix and a thorough examination of the position of the fetus is made. The external hand should

then by gentle pressure raise the fetal head from its position above the pelvic brim. As this is done the internal hand passes upward and seeks the legs and feet. If both can be identified the lower foot and leg should be firmly grasped, or if convenient both feet and legs. The operator must remember in all manipulations to turn the fetal back toward

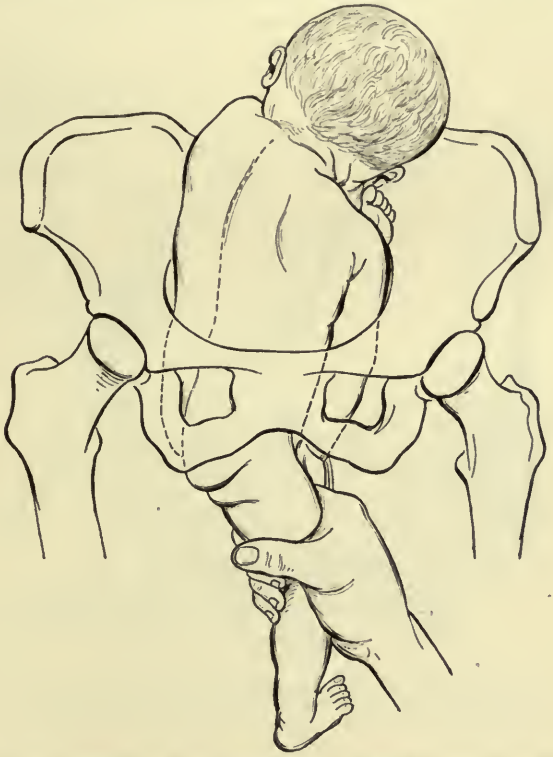

Fig. 126.—Bringing down the fetus by traction upon the thigh.

the pubes, as otherwise difficulty may be experienced in delivering the aftercoming head. When one or both lower extremities have been secured, intermittent and gentle traction is made downwards and backwards until the feet emerge through the vulva. With the external hand the head is

pressed up until the version is completed, and the fetus is then followed down by external pressure to preserve, if possible, the flexed position of the head and the folded position of the arms.

Extraction.—If the operator decides not to extract the child the operation ceases when the feet emerge from the vulva. The patient must then be allowed to recover con-

Fig. 127.—Extraction of the breech by making traction in the fetal groins.

sciousness, and delivery by breech presentation should be awaited.

In most cases version is followed by extraction. To perform this the uterus is stimulated by contraction, by an assistant, by massage and downward pressure.

The operator, as the feet descend, wraps the fetus and limbs of the child in a warm sterile towel. This has the

double purpose of preventing reflex stimulation to respiratory movements through contact with the external air, and affords the operator a firmer grasp upon the fetal body. Aiding the pressure from above and the uterine contractions, the body of the child is brought gently downward until the hips emerge at the vulva. Grasping the feet and legs with one hand, the back being anterior, the fetal body is then rotated obliquely in the cervix and vagina, and the disengaged

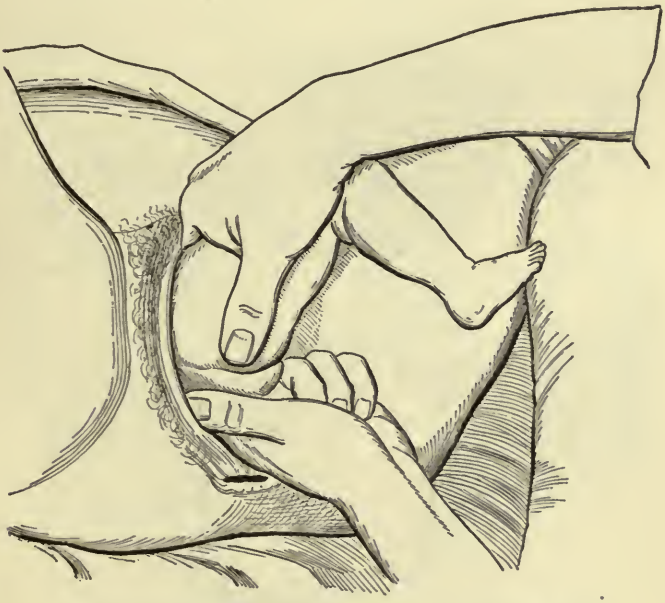

Fig. 128.—Extraction; delivering the posterior hip.

hand is passed upward over the fetal back upon the posterior shoulder. From the point of the shoulder the fingers are then passed, with the palmar surface upon the humerus, down to the elbow, and the arm carried gently downward and across the chest of the fetus. This manœuvre causes complete descent of the arm and forearm and brings the arm down through the pelvic brim. The internal hand should

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then be removed and grasp the fetal legs with a hot sterile towel, and the body of the child should be rotated in the opposite oblique diameter of the birth canal. The other hand of the operator is then passed over the fetal back to the shoulder and the remaining arm brought downward and across the fetal chest. This manœuvre completes the descent of the arms.

Fig. 129.—Extracting the arm extended over the head.

The Delivery of the Aftercoming Head.—When the arms have been brought down, an assistant should make firm pressure above the pubes downward and backward. Grasping the pelvis of the child, wrapped in a hot sterile towel, the operator should make traction downward and as nearly backward as possible until the head is in the pelvic brim. Turning his left forearm and hand with the palmar surface of the

hand uppermost, the child's body is allowed to rest astride the forearm while the long finger of the upturned hand is inserted into the child's mouth. Gentle but firm traction is made upon the base of the tongue and the lower jaw. The other hand of the operator is passed over the back of the fetus,

Fig. 130.—Forceps to the aftercoming head.

the fingers divided at the neck and resting upon the fetal shoulders. With the combined grasp the head is rotated into one of the oblique pelvic diameters, and while external pressure is made downward and backward the fetal head is brought over the pelvic floor and perineum with the two

hands of the operator by traction downward and backward, then upward and forward beneath the pubes.

So soon as the child is extracted the mouth should immediately be cleansed with soft sterile linen and sterile solution of boracic acid. If the cord is beating it should not be tied and cut, but allowed to cease its pulsations spontaneously. If the cord is not beating it should be tied and cut at once. Delivery of the placenta, the irrigation and packing of the uterus, and repair of lacerations, should be done as has been described in treating of delivery by forceps.

Fig. 131.—Delivery of the aftercoming head. The fingers of the obstetrician's hand in the mouth of the child astride his left arm, his right hand making suprapubic pressure.

The Forceps to the Aftercoming Head.—After performing internal podalic version the operator sometimes finds that

the fetal head cannot be brought through the pelvis without the exercise of undue force. In these cases if possible the head should be rotated in one of the oblique diameters of the pelvic brim. While an assistant raises the limbs and body of the child above the pubes the operator introduces the obstetric forceps obliquely applying them to the sides of the child's head and along the forehead. Axis traction should then be made, aided by suprapubic pressure, and the head thus extracted.

The Delivery of the Child When the Back is Posterior.—When the operator is unable to rotate the back of the child beneath the pubes, especial care is necessary that the chin is not carried upward behind the pubes and the head thus become impacted. The arms may be brought down in the manner already described, and for the extraction of the head the operator should endeavor to introduce the fingers into the fetal mouth and bring the chin as nearly as possible with the fetal neck and chest. Then by rotating the body and head in an oblique pelvic diameter aided by suprapubic pressure, it may be effected.

If the forceps must be used to the aftercoming head with the back posterior, the forceps must be applied along the sides of the head in an oblique diameter. It is essential in these cases, whether delivering by the hands or with forceps, to bring the chin behind the pubes and beneath the pubes, and should the operator fail in this, craniotomy may become necessary.

Injuries to the Mother Accompanying Podalic Version and Extraction.—In addition to rupture of the uterus, to which reference has been made, in many extraction of the fetus by the breech causes considerable laceration in the cervix, the pelvic floor and perineum. Where the operation is necessary before full dilatation has occurred, the operator should dilate the cervix as completely as possible, while the patient is deeply anesthetized, before he performs version.

Before attempting version the operator must remember to palpate the abdomen to search for the contraction ring which marks the lower edge of the upper segment, and to ascertain whether or not the lower segment is excessively distended. Should the uterus be in firm contraction with

the contraction ring evidently present and the lower segment greatly distended, internal version should not be attempted. Delivery must be accomplished by embryotomy or section.

Injuries to the Child in Version and Extraction.—In this operation the fetal lower extremities may be injured where the legs are extended and sometimes stretched upward in front of the child's body. In these cases the bringing down of the leg or legs may be difficult and fracture or sprain may result.

In bringing down the fetal arms, if pressure be wrongly made and manipulation is done too hastily, the fetal arm may be broken. Such fracture usually occurs at the surgical neck of the humerus, but it may be found in the shaft of the bone and is usually of the green-stick variety. Where the fetus is of excessive size and must be drawn forcibly through the pelvic brim fracture of the clavicle may occur. When bringing down the head the mouth may, by undue pressure, be injured, and the lower jaw may be fractured or dislocated.

If there is disproportion between mother and child and if the aftercoming head be delivered rapidly and forcibly, depression of one or more cranial bones, or fracture of the parietal bones may result.

In contracted pelvis where disproportion is too great for safe vaginal delivery and where version and extraction are improperly undertaken, the fetal cranium may be fractured by fracture of a parietal bone.

In the delivery of the aftercoming head, in almost all cases the fetus is subjected to unusual danger through pressure of the cervix upon the child's neck. Such pressure interferes with the circulation of the fetus and causes involuntary respiratory movements, which may result in the inspiration of the uterine contents and the development of inspiration pneumonia.

During descent of the child's body and its delivery, the umbilical cord may become pinched between the fetal body and the sides of the pelvis, and asphyxia may result. Because of this occurrence, version and extraction has a considerable fetal mortality and is much more dangerous to the fetus than delivery by section, or the skilful use of the forceps.

Internal Podalic Version for Prolapse of the Umbilical Cord.—In this manipulation the prolapsed portion of the cord is taken in the hand which is to grasp the feet and legs and the cord is carried through the cervix and well above the pelvic brim. This will prevent pressure upon the cord as the child's body is brought down. The replacing of the cord must immediately be followed by version, as the cord will again prolapse if the fetus remains transverse and the fetal body does not block the pelvis.

The Advantages of Internal Version and Extraction.—The great advantage of this obstetric operation lies in the fact that it does not require incision and that it can be carried out by a skilled operator with but little assistance. A reliable anesthetizer is indispensable, and with such help the obstetrician may, if necessary, perform version and extraction alone. As these cases often have lacerations, the operation, if possible, should be done in hospital, where the facilities for surgical operations are given.

CHAPTER XX

EMBRYOTOMY

By embryotomy is understood the lessening in size of the fetal body or the removal of a portion of the fetus. The operation necessarily destroys the life of the child.

Varieties.—As the head usually presents, the most frequent form of embryotomy is craniotomy. In transverse positions with breech extraction, it is sometimes necessary to cut the clavicles and permit the collapse of the shoulders. This is termed cleidotomy.

In cases of abnormal condition of the fetal body it may be necessary to open the abdomen or chest and extract a portion or all of the viscera. This is termed evisceration.

In transverse position shoulder presentation, with the uterus tightly contracted upon the child's body, it may be necessary to sever the neck, performing decapitation. Where the shoulder is wedged into the pelvis the amputation of the prolapsed arm at the shoulder may be required. In cases of unusual difficulty the operator may be obliged to bring away the fetus in pieces as best he can.

Craniotomy.—By craniotomy we understand the lessening in size of the fetal head, accomplished by opening the head, allowing its contents to escape, collapsing it by the pressure of the pelvis, or crushing the head by an instrument prepared for the purpose. When the base of the cranium is crushed the operation is called basiotripsy.

Indications.—The indications for craniotomy are an unfavorable position and presentation of the fetal head, the child being dead or dying, and the mother's condition such that vaginal delivery is indicated. Craniotomy may also be performed upon the dead child, the head presenting in cases of moderately contracted pelvis.

Where other efforts fail to deliver the aftercoming head in version and extraction, craniotomy may become necessary.

Where the child is dead and impacted in the pelvis, if in the judgment of the operator the head should be lessened in size to avoid injury to the mother, craniotomy is the operation of choice.

Craniotomy, Cranioclasis, Cephalo-tripsy.—Craniotomy means simply the cutting, piercing or opening of the fetal cranium. This does not lessen the size of the head. For extraction, craniotomy must be followed by cranioclasis or cephalo-tripsy.

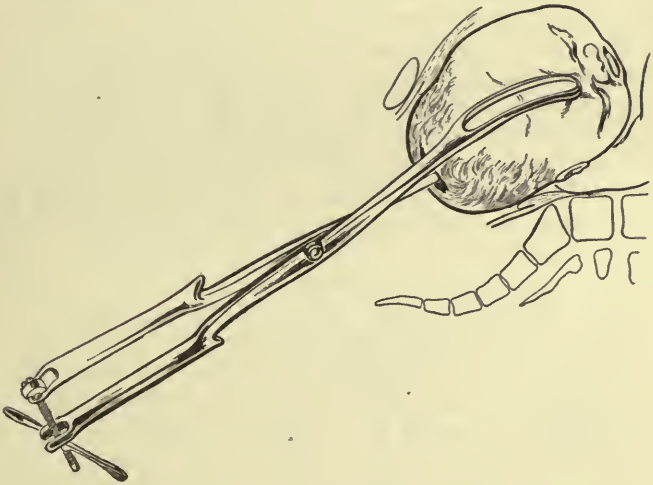

Fig. 132.—The application of the cranioclast to the perforated head for delivery (after Liepmann).

By cranioclasis is meant the collapse of the head after it has been pierced and emptied by drawing the head with the cranioclast through the pelvic brim and cavity. The pressure of the pelvis upon the empty head causes it to collapse and lessens its diameter.

By cephalo-tripsy the crushing of the head is understood. This is usually preceded by preparation for craniotomy, but cephalo-tripsy may be done upon the unopened head. Pressure is exerted by strong serrated forceps especially designed for the purpose.

Technique of Craniotomy, Cranioclasis, and Cephalotripsy.—These operations are frequently performed in cases where the mother has been long neglected in labor, where her tissues are bruised and swollen, and where infection may already be present. For these reasons, these cases must often be considered as infected, and the operator and assistant should take especial precautions to avoid becoming infected during the operation.

The patient is placed in the dorsal position upon a suitable table, the limbs supported by assistants or by a sheet, and thorough antiseptic precautions are carried out. The bladder must be completely emptied by catheter. The operator, with gloved hand, palpates the head and the pelvis, and exactly determines the position of the head. If possible, the head should be opened through the parietal bone, as this gives a firm point for operation and results in the best collapse of the head. When the position of the head has been ascertained, an assistant, by suprapubic pressure, should keep the head firmly at the pelvic brim. Using the fingers of one hand as a guard, the operator may then open the head through the parietal bone by the simple perforator, a pair of strong pointed scissors designed for the purpose, or he may trephine through the parietal bone with Brauns' obstetric trephine. In doing this, care must be taken to hold the trephine firmly against the cranium, as otherwise it might slip and injure the mother. If the scalp is greatly swollen it may be necessary to cut through it down to the bone before applying the trephine. When the button of bone has been removed, the membranes at the brain should be torn open and a large dull-edged spoon curette introduced, and as much of the brain as possible should be brought away. Through the curette the cranial cavity may be irrigated with salt solution, or lysol 1 per cent. The internal blade of the cranioclast is then passed through the trephine opening, and the external blade adjusted upon the cranium, care being taken to carry the blades down to the base of the skull to secure a firm grasp. The blades are then closed and securely fastened by a binding screw at their external extremity. Traction is then made in the axis of the pelvis, and the head slowly and gradually brought through the pelvis and delivered. During

this procedure the pressure of the pelvic walls will cause the head to collapse and it will emerge greatly elongated, with the cranioclast at the apex of its pyramidal form.

If the head be unusually hard and its bones resisting, it may be necessary after performing craniotomy, to crush the head before delivery. For this purpose the blades of the cephalotribe are inserted along the sides of the pelvis and the head grasped without regard to its position. By a powerful compression screw the blades of the cephalotribe are

Fig. 133.—Perforating the cranium through a parietal bone (after Liepmann).

brought together with the head in its grasp, and the head is crushed. Its extraction follows in the same manner as in forceps operations.

The Basiotribe.—Various instruments have been devised by which the head can be pierced and the external blades of the basiotribe carried at once to the base of the cranium, the head crushed and extracted in the grasp of the basiotribe, with the perforator still within the cranium. Such instruments have a central stem or perforator, with such a lock

that the two blades in locking include the perforator. In the use of these instruments no attempt is made at cranioclasis, nor is the cranium emptied before extraction. During extraction the brain matter is usually forced out through the opening made by the perforator.

Craniotomy upon the Aftercoming Head.—When the aftercoming head cannot be delivered in the usual manner and craniotomy is indicated, some difficulty may be found in securing a suitable point of approach in the fetal head. If the chin be anterior it may be necessary to enter the head beneath the chin, passing the perforator upward through the mouth into the base of the brain. In some cases perforation is done near the junction of the frontal and parietal bones. Where the mouth can be reached it may be necessary to open the cranium through the roof of the mouth. In some cases where the breech has been born, craniotomy is best performed by opening the head beneath the occiput.

The Child in Craniotomy.—Some patients have religious views concerning the baptism of the newborn child, in cases where its life is lost or in danger. If the necessity arises for doing craniotomy upon a living child the opportunity must be given to have the rite of baptism administered, if desired, so soon as the child's scalp becomes visible during delivery.

Craniotomy is always a distressing operation, and every precaution should be taken that the mother does not see the child, nor that it is seen by any except the father or some responsible relative. Exaggerated stories of its condition may greatly depress the mother.

The Dangers of Craniotomy for the Mother.—Craniotomy exposes the mother to the dangers of wounds and lacerations produced by the slipping of the perforator or trephine, or the pinching and tearing of tissue by the cranioclast or cephalotribe. The ignorant and careless performance of the operation has torn the uterus, and has even opened the intestine, which prolapsed. Where the operation is unskilfully performed, the edges of broken or crushed cranial bone may pierce the fetal scalp and wound and lacerate the mother. As many of these patients are exhausted and shocked at the time of operation, relaxation and post-partum hemorrhage may follow.

Embryotomy other than Craniotomy.—For cleidotomy and other varieties of embryotomy, long blunt-pointed scissors strong enough to sever the fetal bones, are required. In cleidotomy, while the fingers of one hand act as a guard, the blunt-pointed scissors are pressed against the clavicle firmly, and the skin and bone severed at the same time. Amputation is performed in a similar manner, and the opening of the chest and abdomen are done in this way. In addition to the scissors the operator may often be greatly helped by long clamps, such as are often used in vaginal or abdominal

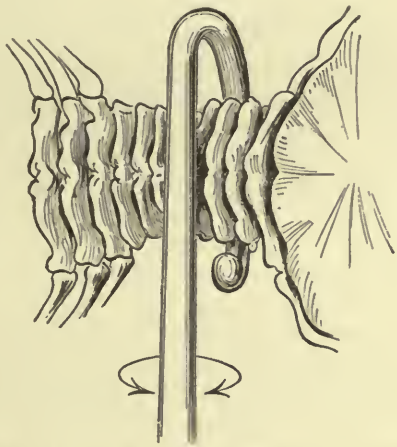

Fig. 134.—Decapitation with the blunt hook.

hysterectomy. As these instruments have a firm grasp they may be used for bringing away pieces of cranial bones.

Decapitation.—To perform decapitation, if the fingers can reach the neck the tissues should be protected with one hand while with the other the operator severs the neck with blunt pointed scissors. Some prefer to use a Brauns' decapitation hook, which is passed over the neck, while the side-to-side motion with traction forces the hook through the skin and muscles and through the vertebræ. In difficult cases especial care is necessary in decapitation to prevent instruments used from wounding the mother.

The Delivery of Fetal Bones.—In neglected cases where unskilful efforts have been made to perform craniotomy the obstetrician may be obliged to extract the head in pieces. For this purpose strong serrated forceps are desirable and with these and the aid of the blunt-pointed scissors, delivery can usually be effected.

The After-treatment of Cases of Embryotomy.—As so many of these patients are infected at the time of operation, and as the danger of uterine rupture is always present, after extracting the child the operator should deliver the placenta and palpate the interior of the uterus to ascertain its condition. If rupture and laceration are absent, the uterus should be irrigated with hot 1 per cent. lysol, and packed with 10 per cent. iodoform gauze. If the condition of the tissues justifies it, immediate suture of lacerations should be done. If conditions are unfavorable, twenty-four hours may be allowed to elapse before sutures are inserted.

Craniotomy upon the Living Child.—In the present state of obstetric surgery embryotomy upon the living child, in good condition, must be abandoned. If, however, the obstetrician be the only physician available and the parents absolutely decline delivery of the living child by section, the demands of humanity would oblige the obstetrician to perform craniotomy upon the living child, but under protest. Should the patient be so situated that she can readily obtain medical aid, the obstetrician would be justified in withdrawing from the case.

If the child has been exposed to long and severe birth pressure, with the probability of infection, and if craniotomy is demanded in the interests of the mother, the indications are clear for its performance.

Mortality and Morbidity.—The mortality and morbidity of embryotomy in themselves are low. So many of the patients who require these operations are exhausted and infected by previous attempts at delivery, or by hemorrhage, that considerable mortality and morbidity result.

CHAPTER XXI

PREVENTION AND CLOSURE OF LACERATIONS

Laceration of the birth canal in labor is most apt to occur where the child is larger in proportion than the mother, where the mother is ill-developed and with abnormal tissues, where an unfavorable position and presentation bring the head through the birth canal in an unfavorable position, where undue haste is used in delivering, where delivery is practised before dilatation is complete, and where the mother is not under control at the time of delivery. Some laceration is often inevitable in primiparous patients and its occurrence reflects in no way upon the attending obstetrician.

Prevention of Lacerations.—A knowledge of the relative size of the birth canal and of the fetus is of great value to the obstetrician in conducting labor. Thus forewarned he can avoid procedures liable to cause injury and by artificial dilatation and skilful delivery minimize lacerations. The precaution to avoid delivery before the cervix is dilated is often neglected and is a frequent cause of laceration. During expulsion of the child the mother should be controlled by anesthesia, or if this be not necessary, by avoiding straining and contraction of the abdominal muscles. This can often be accomplished if the patient's mouth be kept widely open and if she breathes with the thorax only.

In primiparæ at least laceration is less frequent if the patient turns upon the side at the moment of delivery. In instrumental delivery through the vagina, traction must be made in the axis of the pelvis until the pelvic floor is reached, when the line of traction should be upward and forward.

The Support of the Perineum and the Pelvic Floor.—In attempting this it must be remembered that a central tear of the perineum extending only through the mucous membrane and connective tissue is unimportant and readily re-

paired. On the contrary, lacerations of the pelvic floor and pelvic fascia may lead to prolapse. The support of the pelvic floor should not extend beyond the middle of the distance between the anus and the fourchette. The skin perineum should thus be left through at least half of its extent without support visible and laceration should be permitted there in preference to deeper injury.

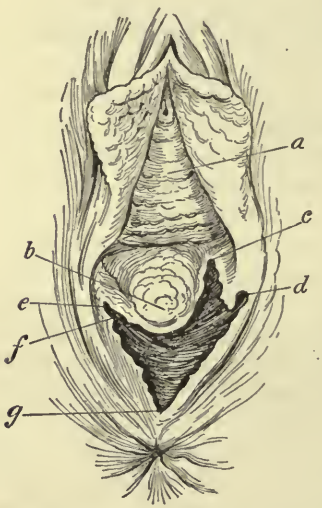

Fig. 135.—Incomplete laceration of the pelvic floor and perineum: *a*, anterior vaginal wall; *b*, posterior vaginal wall; *c*, the highest point in the tear in the left sulcus; *d*, the lowest point in the tear in the left sulcus; *e* and *f*, the tear in the right sulcus; *g*, the lowest point in the tear in the perineum.

It must also be remembered that if the head be pressed too strongly upward during delivery that the occiput may lacerate the anterior segment of the pelvic floor, causing hemorrhage from small blood vessels near the clitoris and urethra.

Diagnosis of Lacerations.—Lacerations of the genital tract occurring in labor are diagnosticated accurately by visual examination only. Clotted blood may obscure the feeling of the tissues and lead to error.

To thoroughly examine the genital tract the patient should be upon her back at the edge of a high bed or table, and the lower extremities flexed and rotated outward. The two lips of the cervix should be grasped by tenaculum forceps, and with a good light directed upon the parts, should be drawn downward until they are plainly visible. If blood be wiped away from the tissues the cervix can be completely inspected. The difference between a smooth tissue covered by normal membrane and the recently torn parts is readily discernible.

To detect laceration of the pelvic floor, the long finger of the gloved hand should be introduced into the bowel and the pelvic floor raised, while accumulated blood is sponged away.

The left side should first be examined as laceration is most frequent there, and if a tear has occurred it becomes visible. Lacerations of the anterior segment of the pelvic floor are readily detected by separating the labia, and sponging. Perineal tears are evident on inspection, and complete tears involving the bowel become plainly visible with sponging.

Should hemorrhage complicate lacerations, it will suggest that injury has occurred if a small but constant stream of

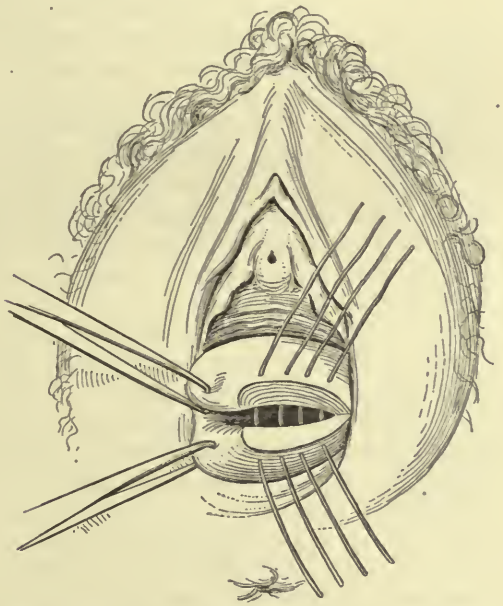

Fig. 136.—The immediate repair of laceration of the left side of the cervix.

bright blood issues from the vagina while the uterus remains firmly contracted.

The Treatment of Lacerations.—Obstetricians differ somewhat in opinion concerning the advisability of closing immediately all lacerations of the cervix. All are agreed in advising that, where cervical lacerations are sufficiently extensive as to cause hemorrhage, such should immediately

be closed by suture. The writer's experience is in favor of closing all cervical lacerations which are more than a quarter of an inch in extent.

To accomplish this the two lips of the cervix are grasped with tenaculum forceps, the cervix drawn downward and then strongly toward the right side. When the left labium is drawn outward and the tissues are sponged, the laceration of the left side of the cervix becomes plainly visible. This should be closed by stitches of chromicized No. 2 catgut, inserted with a curved needle, especial care being exercised in introducing the first and highest stitch. If the laceration is extensive it may be difficult to reach the beginning of the laceration, but as this stitch is the most important of all it must be correctly placed. Stitches are inserted at intervals of a quarter of an inch until the laceration is closed almost to the external os. The cervix is then drawn toward the left side, the right labium opened, and the laceration upon the right side closed in the same manner. Should a cervical tear extend upward to and through the vaginal junction it can rarely be successfully closed by suture. As much as possible of the laceration should be brought together, and oozing from the remainder controlled by intrauterine tamponing with gauze and the vaginal tampon.

Lacerations of the Pelvic Floor.—When these have been exposed in the manner described, the more extensive lacerations should first be sutured. Especial care must be taken to close accurately the highest point of the laceration. Interrupted stitches of No. 2 chromicized catgut are placed at half-inch intervals, the curved needle going sufficiently deep to bring together not only the mucous membrane of the vagina but the connective tissue and fascia beneath it. When the deeper portions of the lacerations of the posterior segment of the pelvic floor have been closed it is well to bring together the torn edges of the perineum, for if this precaution be not taken the suture of the pelvic floor may be carried too far down upon the posterior vaginal wall, and the vaginal wall will be drawn downward instead of being raised upward and backward.

The Closure of Perineal Lacerations.—The sphincter of the bowel should first be examined if laceration has extended

to this point. If it has been torn, one or two buried sutures of fine catgut or fine silk should be inserted through the fascia and muscle, bringing the muscles separately, completely together. If the tear is deep, a line of buried stitches of fine catgut should bring together the deeper connective tissue and fascia. The skin perineum should be closed from the anus upward by interrupted stitches of silkworm gut, not drawn so tightly as to make tension. When the skin perineum has been brought together, the remainder of the lacerations of the pelvic floor are readily closed by interrupted stitches of catgut.

Lacerations of the Anterior Segment of the Pelvic Floor.—These are detected by sponging the tissues about the urethra and the base of the clitoris. These lacerations are longitudinal, varying in length, and often cause considerable bleeding. They should be closed by interrupted stitches of fine chromicized catgut.

Care must be taken not to enter the urethra with the needle if the lacerations are deep. If the lacerations are extensive and vessels have been opened, it is well to tie these separately with fine catgut or fine silk.

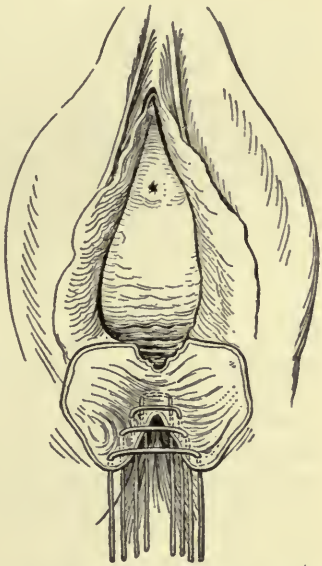

Fig. 137.—Closing the bowel in complete tear of the pelvic floor and perineum.

The Closure of Complete Lacerations of the Perineum and Pelvic Floor.—The complete must be converted into the incomplete laceration by bringing together the mucous membrane of the bowel and the torn ends of the sphincter muscle by continuous sutures of fine catgut or fine silk. It is well to terminate the suture of the bowel at the sphincter and to use separate and interrupted stitches to unite the muscle. When this has been accomplished, the remainder of the

laceration is brought together in the manner previously described.

The Closure of Episiotomy Wounds.—It is sometimes expedient, in cases where considerable disproportion exists between mother and child, to make one or more incisions downward and outward through the labium and connective tissue at the junction of the lower and upper two-thirds of the lateral surface of the opening at the birth canal. These incisions allow the anterior segment of the pelvic floor to retract upward and the posterior segment to retract downward, thus preventing severe central lacerations. After delivery these surfaces are to be closed by two lines of suture —the inner brings together the mucous membrane of the vagina, and the submucous connective tissue; the outer line of suture at right angles to the first, unites the skin and subcutaneous tissue. For the inner suture catgut is preferable, and for the outer silkworm gut.

The Aseptic Care of Lacerated Surfaces.—Cases which have had suture should be taken care of by pouring 1 per cent. lysol or sterile salt solution from a pitcher over the parts after each micturition or defecation and whenever the vulvar dressing has become stained and has been removed. Sutured surfaces should not be rubbed with cotton sponges, nor touched, nor handled. If the patient must be catheterized, especial care must be taken to clean the orifice of the urethra before and after the catheter is used.

If lacerated sutured surfaces heal properly there will be little redness or swelling, pus will be absent, and union will be by first intention. Should these surfaces become infected they will be red and swollen, and pus will exude from the edges. In this event, stitches must be at once removed, the wounds allowed to gape open, and freely flushed with an antiseptic solution. Healing must occur by granulation.

The Secondary Repair of Lacerations.—If the patient's condition makes it impossible to repair lacerations immediately after their reception, a delay of twenty-four or thirty-six hours may enable the patient to recover from labor, and may give the obstetrician better facilities for operation. While a longer delay than this is practised and recommended by some, it has not been accepted by the majority of ob-

stetricians. Secondary operations for the repair of the birth canal should not be undertaken while the mother is nursing her child. Ample time must be given for complete recovery from labor and for involution to take place.

The principles upon which secondary operations are based are the denuding of torn surfaces until they resemble as closely as possible the original laceration and the bringing together of these surfaces by suture. While absorption and atrophy or contraction of the parts occur, it may be necessary to liberate contracted tissue by incisions, making flaps to restore the tissue lost by absorption after the original laceration.

The Removal of the Stitches.—Silkworm gut stitches placed in the skin perineum are ordinarily removed by the tenth day. Catgut stitches do not often require removal. Chromicized catgut occasionally fails to be absorbed and if its presence causes annoyance, such stitches may be removed two weeks after labor. To remove stitches successfully, a strong light is indispensable, and scissors curved upon the flat, are required. If the stitches have become partially buried, a grooved director may be slipped through the stitch, and the blade of the scissors may cut upon the director.

Repeated Lacerations.—Some patients who have sustained lacerations in the first labor, in subsequent parturition tear through the scar of the original laceration. Such tears are rarely extensive and should be promptly repaired.

CHAPTER XXII

INJURY TO THE BONY PELVIS OCCURRING DURING LABOR

In cases of marked disproportion between mother and child, with forcible delivery through the vagina, the sacro-iliac joints may be severely strained, or the pubic joint may be forcibly separated. The left sacro-iliac joint is most frequently involved, and the diagnosis of this condition is made by pain over the joint when the patient turns in bed, or upon walking or making certain motions, as stooping and raising.

On vaginal examination pain may be felt upon firm pressure at the side of the pelvis. If, while the patient is lying upon her back, the lower extremities be flexed completely and rotated forcibly inward and outward, pain will be felt in the sacro-iliac region.

The treatment of this condition consists in rest and in wearing a firm retentive belt. If the patient is gouty or rheumatic, suitable medication is indicated. When the pubic joint is forcibly separated during labor the two halves of the pelvis move with considerable pain. The condition is diagnosticated by introducing the fingers within the vagina and detecting motion of the two halves of the pubic bone as the thighs are flexed and rotated. A firm belt, taking its centre of pressure over the trochanters, is indicated for this condition.

Injuries to the Coccyx Occurring During Labor.—Where the child is excessive in size, or where during forceps delivery the occiput is carried strongly backward the sacro-coccygeal joint may be strained, or the coccyx may be fractured.

This condition is diagnosticated by pain upon introducing the finger within the vagina or rectum and making pressure. If the patient be turned upon her side, and the fingers carried down over the sacrum upon the coccyx, the injury can be detected. Should pain in the coccyx persist after labor, the bone should be removed.

CHAPTER XXIII

THE INDUCTION OF LABOR

The induction of labor is indicated where pregnancy is unduly prolonged, the pelvis being sufficiently large to permit the birth of an average or viable child, or where some condition arises that renders the continuation of pregnancy unfavorable for the life and health of mother and child. Such a condition, however, must not be critical, for the induction of labor is a slow process, and if no time is to be lost it cannot be selected.

As the name indicates, the induction of labor is the artificial establishment of spontaneous delivery. It must be effected by exciting uterine contractions.

While various methods have been tried and discarded, the introduction of sterile bougies with or without the accompaniment of sterile dilating bags passed within the cervix, is the method most widely practised. In some cases, instead of bougies and bags, strips of gauze are inserted through the cervix to bring about uterine contractions and dilatation. In multiparous patients with soft cervix and partial dilatation, the rupture of the membranes is sometimes the method of choice.

Technic.—In induced labor the obstetrician must first ascertain accurately that the pelvis is sufficiently large to permit the passage of the child. It is commonly believed that, unless the antero-posterior internal diameter is 8 cm., the induction of labor, with the hope of securing a viable child, should not be chosen.

As regards the period of gestation, operators aim to induce labor not earlier than the thirty-second week nor later than the thirty-sixth week of gestation.

The clinical test of pressing the head into the pelvic brim by pressure made with the external hand while the internal

hand notes the descent of the head, is a method of proven value.

The patient is prepared for the induction of labor by thorough emptying of the intestine, complete emptying of the urinary bladder, and irrigation of the vagina with 1 per cent. lysol. The external parts are antiseptically prepared. If the patient be a primipara, and sensitive, anesthesia is of great assistance. With the patient in the dorsal position, at the edge of a bed or table, the fingers of the gloved left hand are introduced within the vagina and the effort made to gently introduce one finger through the cervix. If this can be done the finger is swept around the internal os, detaching the membranes from the surface of the uterus as widely as possible. Care should be taken not to rupture the membranes. If the finger cannot be passed through the cervix, the cervix should be drawn down by tenaculum forceps and very gently dilated with solid dilators, until the finger can be introduced.

One or more blunt-pointed sterile bougies of large size should be introduced, and passed gently in the direction of least resistance. They should pass between the membranes and the wall of the uterus until but an inch protrudes from the cervix. If more than one can be introduced, it is well to do so. These are retained in place by tamponing the vagina with moderate firmness with sterile gauze or 10 per cent. iodoform gauze.

It is often convenient to begin the induction of labor at the patient's usual bed-time. If she be given a simple sedative medicine she will often sleep through the night, the cervix will soften and dilate, and actual labor pains will develop during the following day. If it is desired to bring on labor as promptly as possible and the cervix is dilated or dilatable, the dilating bag may be introduced in place of bougies. This should be distended to nearly its capacity and retained in place by a vaginal packing of iodoform gauze.

Unless active pains develop, the patient should not be disturbed until ten to twelve hours afterward, and the bougies or bags should be removed, the vagina irrigated with 1 per cent. lysol, and a careful but gentle examination made. The cervix will be found softened and somewhat dilated

and a greater number of bougies, or a larger bag may be inserted.

During the day the patient should take liquid food only, should remain in bed, and care should be taken that the urinary bladder is frequently emptied. Should active pains begin it is well to remove the bougies to avoid rupture of the membranes. If labor comes on slowly the bougies should be removed in the evening, and more inserted, and the patient allowed to remain undisturbed during the second night. On the day following, the cervix will usually be found sufficiently dilated to permit the introduction of a good-sized bag, which should be distended with antiseptic fluid and left within the cervix. If active pains develop the bougies should be removed. The bag should be completely distended, and if possible should be expelled or drawn through the cervix distended to its full capacity.

The Length of Time Required for the Induction of Labor.—Induced labor varies greatly in duration. Occasionally labor develops actively within a few hours. In insane patients it is almost impossible to induce labor, as the presence of bougies or bags often do not excite uterine contractions. The induction of labor is a comparatively slow and uncertain process, and the pressure of dilating bags may cause the patient severe suffering. Some prefer not to use bags, but to rely exclusively upon bougies and to continue the induction of labor by these means until the cervix is three-fourths dilated. The dilatation may then be completed by the hand and the membranes ruptured, when active labor will follow.

The Maternal Dangers of Induced Labor.—Repeated manipulation may cause septic infection, the introduction of bougies may disturb the placenta, causing hemorrhage, bags may burst and discharge their contents within the uterus, the presence of the bag may disturb a favorable presentation of the head, converting it into an unfavorable, and the patient may become exhausted by nagging and inefficient pains without the development of normal uterine contractions.

Under strict antisepsis, and in skilled hands, the maternal mortality of induced labor is low. Its morbidity is relatively high because dilatation is accomplished through a birth canal

not physiologically prepared for labor, and hence considerable laceration may occur.

The Effect upon the Child in Induced Labor.—The mortality of the child in induced labor is considerable because it is delivered through an imperfectly dilated birth canal, and in many cases is premature. The most common cause of fetal death in induced labor is birth pressure.

The morbidity among children so born is considerable, as labor must frequently be terminated by forceps or version, and the premature child is subjected to considerable force. In comparison with spontaneous birth or delivery by Cesarean section, induced labor has a high fetal mortality and morbidity.

Forcible Delivery (Accouchment Force).—By this is understood the forcible dilatation of the cervix followed by immediate extraction of the fetus. This procedure was formerly accomplished by the hand, by dilating bags, or by metal dilators, of which Bossi's is most typical. Since the advances in obstetric surgery have developed Cesarean section, this method of delivery has been abandoned by experienced obstetricians. Injuries to the birth canal, caused by such rapid dilatation and extraction, accompanied by hemorrhage and septic infection, gave results far inferior to those obtained by better methods.

The Complete Dilatation of the Birth Canal by Bags.—During the latter part of induced labor the obstetrician may desire to dilate not only the cervix but the pelvic floor and vagina as well. To accomplish this the double bag of Pomeroy has been devised. Of this, one portion is inserted within the cervix and the remainder is allowed to remain in the vagina upon the pelvic floor. Both are dilated by sterile fluid introduced by a piston syringe. This device is efficient, but naturally causes considerable pain to the patient.

Dilatation by Bags.—In selecting bags for dilatation they should be tested before introduction, by a strong piston syringe, and some idea obtained of their capacity. For the smaller sizes Barnes' bags are useful, while for the larger dilatation Voorhees and Champetier de Ribes, are well adapted. These have a flat base, and resemble while distended a pyramid. The bag is introduced empty and folded in the grasp

of a suitable forceps. It is held in position until the fluid can be forced into it by a piston syringe. Pressure can be made by the syringe until the fluid in the bag begins to press the piston backward. The tube of the bag is then closed by a clamp forceps, and the forceps is brought up upon the abdominal surface near the groin, and retained in position by a bandage.

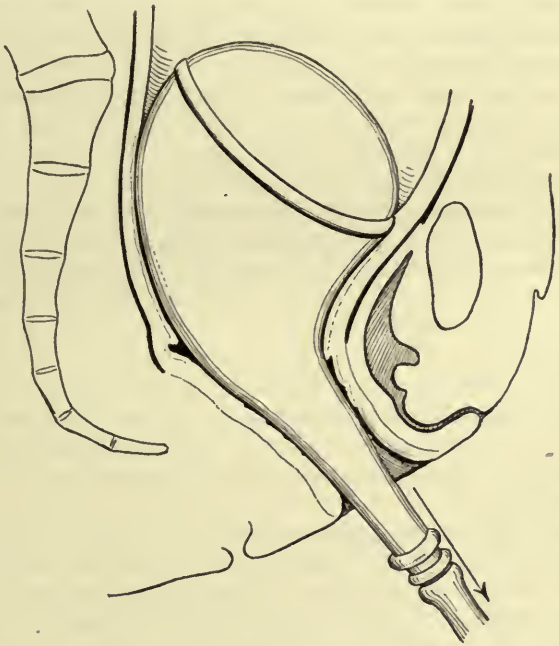

Fig. 138.—Dilating the cervix in induced labor by a dilating bag.

A vulvar dressing should be worn during the induction of labor.

To maintain and promote dilatation, additional fluid should be introduced into the bag every half-hour or hour, until its limit has been reached.

While most of the bags in use are of rubber, the de Ribes' bag is of silk, covered with a smooth and impervious material. A bag fully distended causes severe pressure, and the patient

usually complains of this bitterly. In some cases the bag excites uterine contractions, in others the pain which it causes inhibits the action of the uterus.

When neither bougies nor bags bring on labor, and partial dilatation has been accomplished, with some separation of the membranes, all may be removed and the patient allowed to get up and go about her room. This will frequently result in the development of active labor.

The Treatment of the Patient during Induced Labor.—The obstetrician must be careful to place no limit for induced labor. During this time the patient should take abundant liquid food, avoiding milk, unless it is well digested or is peptonized. The urinary bladder should be frequently emptied, and if the bowels become distended a copious high purgative enema or saline irrigation should be given. At night the patient should have sufficient sedative medicine to induce a reasonable amount of sleep. Efforts should be made to divert her attention from her suffering and to encourage her.

Scrupulous care must be taken, and antiseptic precautions also, to avoid infection. The obstetrician must be notified should bougies or bags be expelled or should the membranes rupture. Should active labor develop vigorously bougies should be immediately removed, but the bag may be left to be expelled.

The Induction of Labor by Drugs.—Certain drugs have had a more or less deserved reputation for inducing labor. Castor oil has long enjoyed this distinction. Quinine has proven reliable in some cases, and worthless in others. Strychnia as a stimulant in weak patients will sometimes produce the desired result. Ergot has been abandoned because it is dangerous, by all well-informed obstetricians.

Much has been written concerning the specific action of pituitrin. This substance produces rapidly developing and strong uterine contractions. Its action is not sustained, but is vigorous while it lasts.

Unless dilatation is complete, presentation and position favorable, and the membranes ruptured, with no disproportion between mother and child, pituitrin should not be used. With an undilated or partly dilated cervix, and without other

conditions favorable for spontaneous delivery, pituitrin has caused rupture of the uterus.

The Induction of Labor by Mental Effect or Suggestion.—Unquestionably in some patients labor can be induced by suggestion only. The writer at one time had a patient, the wife of a physician, who was conscious of the fact that she had a contracted pelvis.

The induction of labor was selected as the mode of treatment, and accepted by husband and wife. At a certain date antiseptic preparations were made for induced labor, and during the following night, without interference and without the action of drugs, labor developed and resulted spontaneously.

In this case the patient was fully aware of the conditions present, the statement was made positively to her that labor was coming on, and this statement she believed.

This happened in three instances, and it was never necessary in her case to interfere or to give drugs, further than antiseptic preparations and the administration of a simple laxative.

Much of the effect produced by drugs is probably due to mental suggestion. In some cases drugs fail utterly to induce uterine contractions.

The most efficient and least harmful method of inducing labor without manipulation consists in the positive statement that labor will come on, accompanied by the administration of a large dose of castor oil. If this be followed by a copious hot enema, or a high colonic irrigation, the desired result will often be produced. On the other hand, if the patient is very sensitive to suffering, and rests nervously, and is fearful of the result of her labor, manipulation and the introduction of bougies and bags, may fail utterly to produce normal uterine contraction.

The Induction of Labor by Rupture of the Membranes.—This expedient should not be resorted to in primiparous patients unless dilatation is three-fourths complete, and the conditions all favorable for spontaneous birth.

In multiparous patients with softened cervix, with one-half dilatation, this method is justifiable. If a moderate dose of opium be given after the rupture of the membranes,

labor will frequently develop and may terminate quickly. After the rupture of the membranes the patient must wear a sterile vulvar dressing and must remain recumbent.

Delivery through the Vagina without Uterine Contractions.—This procedure is so dangerous that it is mentioned to be condemned. If uterine contractions cannot be induced the patient should be delivered by external means, the uterus opened by incision, and immediately closed by suture. Thus the forcible dilatation of the cervix when the uterus does not act, followed by extraction by forceps or version, may be followed by severe shock and hemorrhage. Elective Cesarean section, on the other hand, is accompanied by very little shock.

CHAPTER XXIV

CESAREAN SECTION

This title is used under the belief that the birth of Cæsar was accomplished by abdominal section. At present, under this general term, are included several methods of delivery by which the child is removed by incising the uterus, preceded by abdominal or vaginal section.

At present we distinguish the classic abdominal Cesarean section, which is intraperitoneal; extraperitoneal Cesarean section; delivery through a peritoneal fistula, preceded by abdominal section; and vaginal Cesarean section.

THE CLASSIC ABDOMINAL CESAREAN SECTION

This consists in opening the abdomen, removing the uterus from the abdominal cavity, or allowing it to remain in the abdominal cavity; opening the uterus by incision, extracting its contents, and closing the uterine wound and the peritoneal and abdominal wound. It is obvious that in this operation no organ is removed and that the patient is left capable of further procreation.

Indications.—The original indication for this operation was contracted pelvis or such disproportion between mother and child that vaginal delivery of a living child was impossible or delivery by embryotomy highly dangerous for the mother. As obstetric surgery advanced this operation was used where labor was obstructed by pelvic and abdominal tumors, uterine or connected with other organs; where the fetus was in an impossible presentation for spontaneous birth and the tetanic condition of the uterus threatened rupture; where the mother was physiologically unfit to develop the nervous and muscular energy necessary for vaginal birth; in placenta prævia, where so much of the cervix is covered by placenta that vaginal delivery is highly dangerous for mother and

child; in separation of the normally implanted placenta, the child viable and in fair condition, with the cervix undilated; and in eclampsia.

Elective Section, and Section during Labor.—Originally Cesarean section was practised, after other methods of delivery had been unsuccessfully tried, as a last resort. Its maternal and fetal mortality were inevitably high. Later it was, and still is, used, after a reasonable test of the natural forces of labor has been made. Thus, where there is not great disproportion between mother and child, the patient being a vigorous primipara, it may be wise to make the test of labor to secure engagement and descent before resorting to section.

Where a definite pathological condition is present which can be clearly distinguished, and which must make vaginal delivery dangerous, the operation may be a purely elective one, at a time chosen by the operator in the best interests of mother and child, and without subjecting her to the pain and exhaustion of labor.

Methods of Performance.—The classic abdominal Cesarean section is done by the majority of operators by opening the abdomen and delivering the unopened uterus from the abdominal cavity, the intestines and other viscera being carefully covered and protected by large pads of sterile gauze wrung out of hot salt solution. Experience has shown that the amniotic liquid often becomes infected after the membranes rupture, or from bacteria from the child's intestine, and that the amniotic liquid may infect the peritoneum. If the uterus be removed from the abdominal cavity, it is opened and the amniotic liquid allowed to escape over the side of the patient, the danger of contaminating the peritoneum being less.

The uterus is opened longitudinally in the centre on its anterior aspect through the contractile portion of the womb, care being taken to avoid the lower portion and the lower uterine segment. The incision should not be too large, but large enough to permit the prompt extraction of the fetus, as the uterus will contract during the delivery of the child. If the operator prefers, the incision can usually be enlarged slightly by blunt-pointed scissors, or by the fingers. At the

moment when the uterus is opened some operators prefer to have an assistant grasp the uterine arteries in the broad ligaments, thus controlling hemorrhage. The uterus is turned over one side of the patient's body if the membranes have not ruptured, so that the amniotic liquid may escape externally. The rupture of the membranes is followed by the immediate extraction of the child, care being taken not to tear the uterus. The child is immediately handed to an assistant, who clamps and cuts the umbilical cord. The placenta is then separated by the gloved hand of the operator,

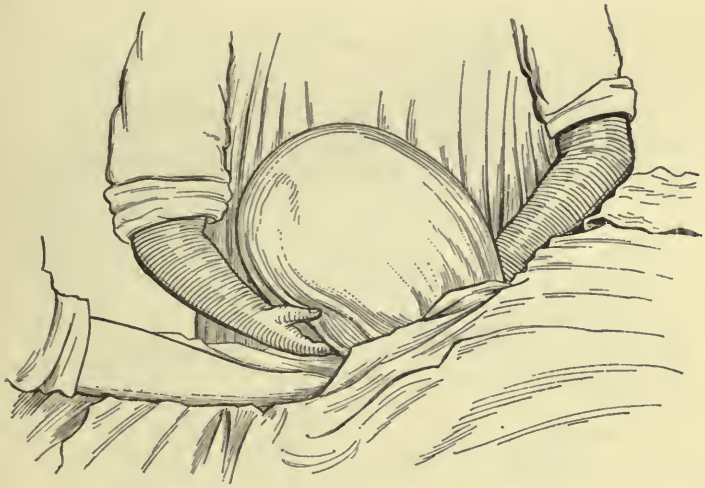

Fig. 139.—Cesarean section: the uterus eventrated ready to open.

and the membranes are carefully separated from the uterine wall. If they are unduly adherent and tear, they may often be removed by grasping them with dry gauze or by wiping the interior of the uterus with dry gauze. If the membranes are unruptured, and the patient has not been long in labor and is in good condition, as little interference as possible should be practised in the interior of the uterus. If the patient has been long in labor, with discolored membranes or amniotic liquid, if she has been subjected to repeated attempts at delivery and examination, and if the uterus con-

tracts poorly with a tendency to hemorrhage, it is well to pour hot salt solution into the uterus through this wound, allowing it to escape through the cervix and vagina. The uterus may then be packed with 10 per cent. iodoform gauze, the end of which is brought through the cervix into the vagina.

The suture of the uterus is the cardinal point in the classic abdominal Cesarean section. The uterine muscle should be closed by interrupted stitches of silk of the best quality, the stitch passing down to the endometrium and decidua, but

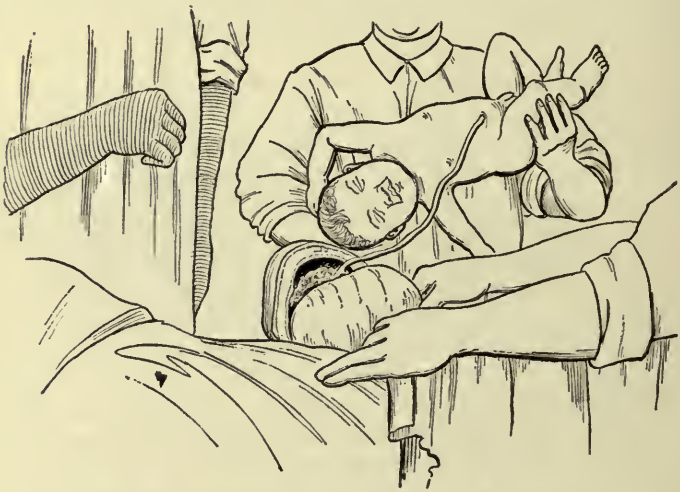

Fig. 140.—Cesarean section; delivery of the child.

not including it. The stitches should not be passed through the peritoneal covering of the uterus. The stitches should be tied so soon as they are inserted, when their application immediately checks bleeding and stimulates uterine contraction. If there are large sinuses in the wound the stitches may often be so placed as to include the sinuses. These stitches are carefully tied and cut short. The peritoneal covering of the uterus is then closed by continuous stitch of fine silk or catgut, which effectually seals and closes the womb. The abdomen is then closed by bringing together, first the

peritoneum with fine silk or catgut; next the fascia; and then the subcutaneous tissue and the skin.

Operators differ in their methods of closing the uterine wall and the abdomen, but the essentials of uterine suture are those described.

If gauze has been passed within the uterine cavity the operation is completed by sponging out the vagina with bichloride solution, pulling down the end of the gauze strip until it is satisfactorily brought through the cervix, and tying to it a strip of bichloride gauze, with which the vagina is

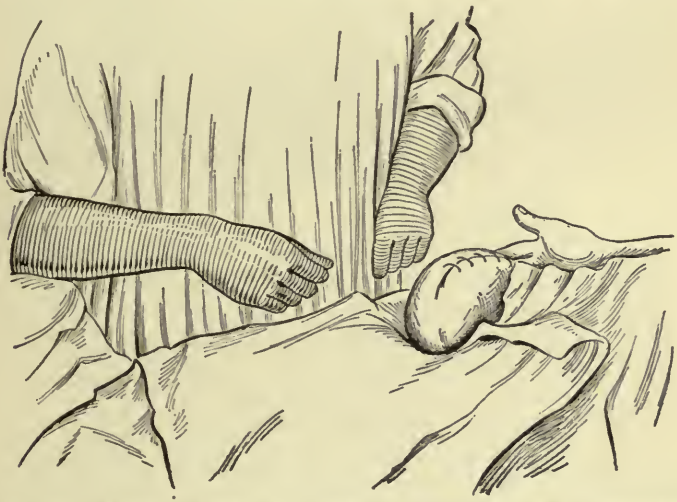

Fig. 141.—Cesarean section; the uterus emptied and closed by suture.

moderately tamponed. This gauze is removed in from forty-eight to sixty hours. The vagina is then sponged out with antiseptic solution, but no douches or other interference are practised.

To avoid disturbing the abdominal contents as much as possible, some prefer to incise the uterus in the abdomen, without removing it from the abdominal cavity. In this operation the abdomen is opened at and above the umbilicus, the abdominal wall separated, while the hands of an assistant press the abdominal walls firmly against the uterus, and press

the uterus upward into the wound. The operator then incises the uterine wall and extracts the child. If the cervix is dilated, some prefer to press the placenta downward, delivering it through the cervix into the vagina. Others remove the placenta and membranes in the usual manner. The uterus is closed as described and the abdominal wall sutured.

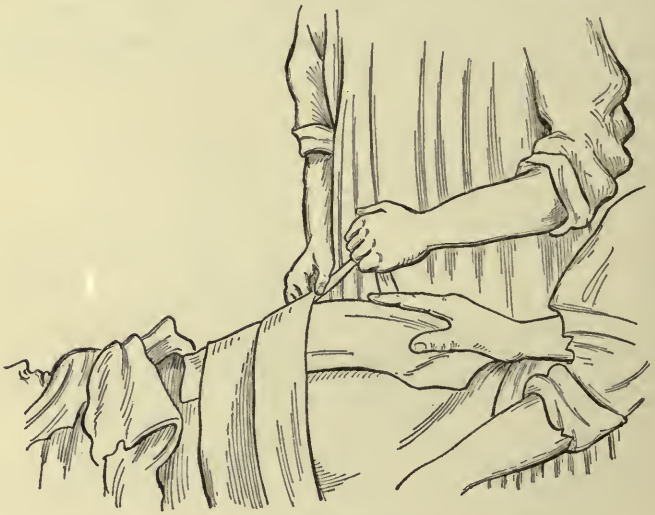

Fig. 142.—Cesarean section: the abdominal dressing.

Those who select this method claim for it the avoidance of shock, and ease and rapidity of operation.

EXTRAPERITONEAL SECTION

This method is based upon the anatomical fact that the lower portion of the abdominal peritoneum at the pubes can often be pushed upward from the anterior surface of the uterus, exposing the lower uterine segment without opening the peritoneal cavity. Frank and others have practised delivery through the lower uterine segment, endeavoring to avoid opening the peritoneum.

Methods of Performance.—For this operation some prefer to have the urinary bladder of the patient completely

emptied by catheter, while others distend it partially with boracic acid solution, so that it may be the more easily manipulated. The incision is made above the pubes and the tissues are retracted, the operator dissecting with the gloved finger or with blunt scissors, down to the peritoneum. This is pushed upward as far as possible and the bladder carried to one side, or if empty pushed downward. The lower uterine segment, if the patient is at term, will then be exposed. If she has been for some time in labor, and the head has distended the lower segment, it becomes more readily apparent. The uterus is then opened longitudinally, and an assistant, by pressing upon the womb, forces the presenting part up through the incision. Some operators prefer to immediately apply the obstetric forceps, if the head is presenting, and deliver with forceps. It is well to avoid version because of the danger of tearing the womb. After the delivery of the child the placenta is forced out by Crede's method and is delivered through the incision. If the cervix is completely dilated, the operator may prefer to force it downward through the cervix and into the vagina with the membranes. If there is a tendency to hemorrhage, or infection is feared, the operator may tampon the uterus with 10 per cent. iodoform gauze, bringing the end of the gauze through the cervix. The uterine wall is then closed with several continuous catgut sutures, in layers. A gauze cigarette drain is placed behind the pubes, and the abdominal wound is closed to the drain.

Delivery through Peritoneal Fistula.—Experience shows that in many cases of attempted extraperitoneal delivery that the peritoneum is opened, and that it is either repaired at the close of the operation or else is stitched to the abdominal and uterine wounds, and delivery is thus made through a peritoneal fistula.

By this method it is claimed that in cases where the uterus is infected delivery may be accomplished with a minimum danger of abdominal infection and peritonitis.

In operating through a peritoneal fistula the abdomen is opened to the peritoneum, and the peritoneum stitched to the anterior surface of the uterus and to the abdominal wall. The uterus is then opened through the fistula so made, and delivery effected as in extraperitoneal section. The oper-

ator, in infected cases, may leave the peritoneal fistula open for complete drainage, allowing it to close by granulation as the uterus undergoes involution. In clean cases the uterine muscle is closed and the peritoneal surfaces above it and the abdominal fascia, subcutaneous tissue and skin.

Fig. 143.—Extra peritoneal Cesarean section throuh a peritoneal fistula. The uterine peritoneum has been incised and sutured to the parietal peritoneum, thus exposing the upper portion of the cervix and the lower uterine segment, which is incised and through which the child is delivered (after Liepmann).

Extraperitoneal Section by Inguinal Incision.—Gailliard Thomas, of New York, and recently Döderlein, of Munich, performed extraperitoneal delivery by opening the abdomen above Poupart's ligament and parallel to it, carrying up the lower portion of the peritoneal sac and incising the uterus through the lower segment and upper cervix.

Thomas called this operation laparo-elytrotomy. Döderlein names it delivery by inguinal incision.

In the hands of a skilled operator this method can be successfully carried out.

Vaginal Cesarean Section.—Dührssen and others have accomplished delivery through the vagina in cases where the cervix offers resistance by what is termed vaginal Cesarean section. This is performed by drawing down the cervix, making a transverse incision across the anterior portion of the cervix at the junction of the vagina, pushing up the tissues which include the peritoneum and the base of the bladder, until the lower segment is visible. The cervix is then grasped by two strong tenaculum forceps and is incised with blunt-pointed scissors longitudinally, the incision passing through the lower segment. Occasionally in cases where the cervix is unusually small and resisting the posterior portion of the cervix is also open. If necessary, the membranes are ruptured and the child is extracted by forceps, rarely by version. The placenta, membranes and cord are expressed from the uterus. The uterus

is then packed with gauze and the tissues closed with continuous buried catgut sutures. The transverse incision is brought together and a small drain is left at the base of the bladder.

This operation is obviously useless in contracted pelvis or where great disproportion exists, and is designed for cases

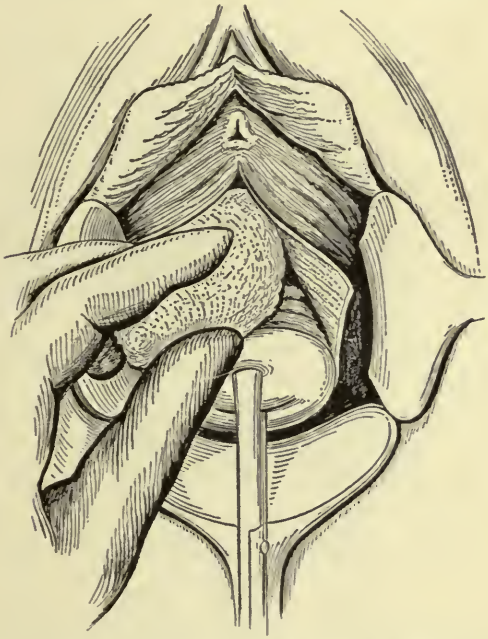

Fig. 144.—Vaginal Cesarean section: flaps of tissue from the anterior vaginal wall pushed back by gauze from the cervix. The bladder pushed upward to avoid injury.

where the cervix is undilated or cannot be dilated, where the fetus is small and where rapid delivery through the vagina is indicated.

Indications for the Classic Abdominal Cesarean Section.—This is the most important and widely used of all forms of delivery by incision, because it enables the operator to deal intelligently with any abdominal complication and any posi-

tion and presentation of the fetus. It is also applicable in cases of septic infection, if followed by the removal of the body of the uterus.

In general, it may be said that abdominal Cesarean section is indicated in primiparæ for considerably contracted pelvis, great disproportion, physiological incompetence for labor, diseased conditions of the uterine muscle, or abnormal

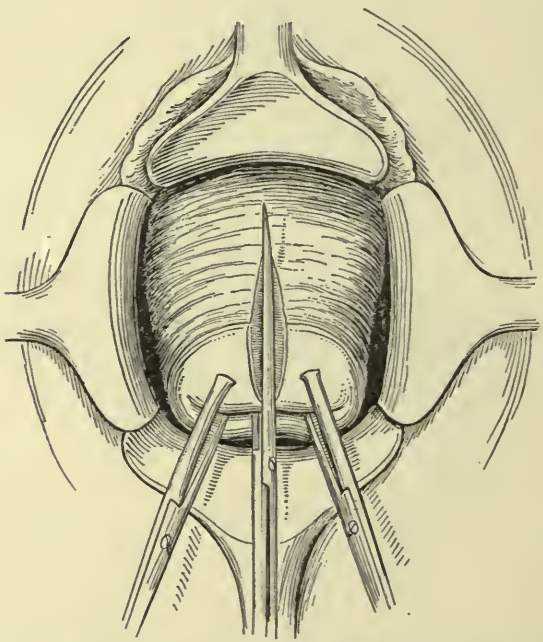

Fig. 145.—Vaginal Cesarean section; incising the anterior lip of the cervix.

conditions of the uterus caused by ventro-suspension or maldevelopment; tumors of the pelvic or abdominal organs obstructing labor; abnormal positions and presentations of the fetus which expose the mother to the danger of uterine rupture, and the fetus to the risk of its life; central and partial placenta prævia and eclampsis.

In multiparæ, abdominal Cesarean section is indicated

where in previous labors the mother has lost a child or children through birth pressure and difficult delivery, where pregnancy is unduly prolonged, and where the indications already mentioned in primiparæ are present.

Abdominal Cesarean Section in Septic Cases.—Where patients have become infected through long labor with unsuccessful attempts at delivery and repeated examinations,

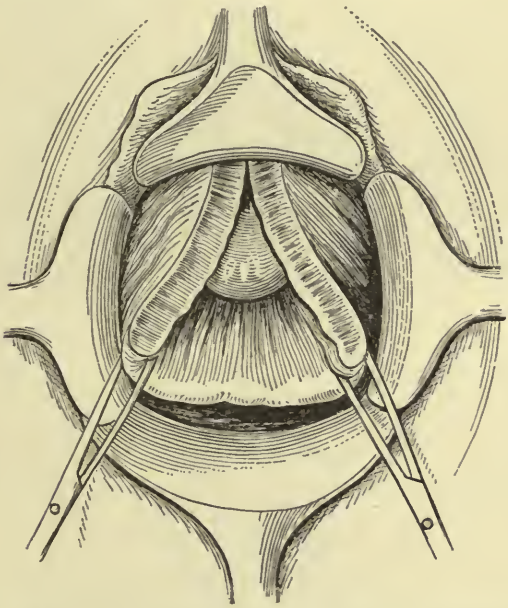

Fig. 146.—Vaginal Cesarean section; the membranes protruding through the incised cervix.

delivery by abdominal section frequently offers the best chance for the life of the mother. It must be followed by the removal of the body of the uterus and the Fallopian tubes, often including the ovaries. The uterine stump must be left outside the peritoneal cavity, and this may be accomplished by using the clamp by Porro's original method, or by performing hysterectomy, and fastening the stump by sutures to the lower end of the abdominal incision. This ob-

viously sterilizes the patient and raises the question, under what circumstances should abdominal Cesarean section be followed by sterilization?

Where the mother is infected, sterilization after section is demanded in the interests of her life. Where abdominal Cesarean section is elective, and if the patient is in good condition, sterilization may be performed when the life and

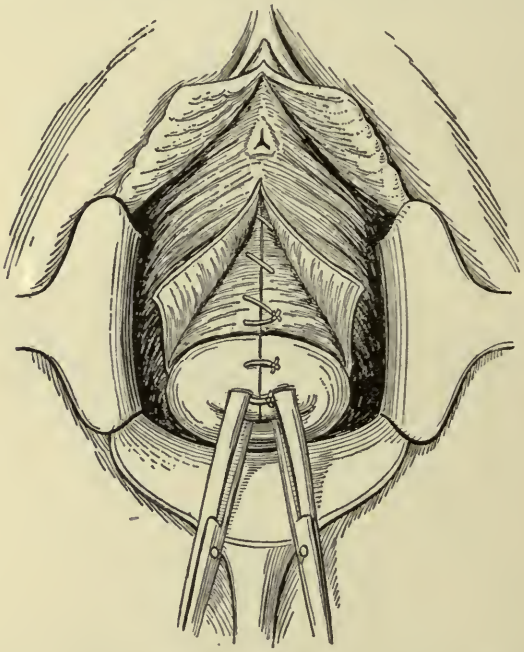

Fig. 147.—Vaginal Cesarean section: the cervix closed by suture.

health of the mother are threatened by childbirth; when pathological conditions exist in the uterine muscle; when the mother is insane or idiotic, or such a person that the production of healthy children by her is impossible. Sterilization should not be done in persons mentally sound until it is positively demonstrated that good and sufficient reason exists, and husband and wife agree and request that it be accomplished.

In clean cases sterilization after section is best effected by performing hysterectomy, removing the body of the uterus and the Fallopian tubes. If the patient has not reached the menopause, one or both ovaries may be left, but if the ovaries are cystic, or the patient is near the menopause, they may be removed with the uterus. In patients who are in good condition the operation is often concluded by the removal of the appendix.

The Preparation for Cesarean Section.—Where ample time is given in elective cases, the patient should enter the hospital one or two days before operation, and the abdomen should be thoroughly prepared on the day preceding delivery. Any reliable surgical method known to the operator may be selected. After preparation the abdomen should be covered with sterile gauze and a bandage. On the morning of operation a copious vaginal douche of 1 per cent. lysol should be given, the bowels should be moved by a cathartic given the night previously, followed by a saline and high saline irrigation. A vulvar occlusion dressing should be worn after preparation.

When the patient is anesthetized she should be catheterized, the abdominal dressing removed, and tincture of iodine applied over the abdominal surface.

Sleep should be secured on the night preceding operation by veronal given with broth, or soup, or with whiskey and water.

One arm of the patient should be prepared for intravenous saline transfusion, and appliances should be at hand for irrigating the stomach at the conclusion of the operation. While in emergencies it is possible to perform Cesarean section in private houses, these operations should be done, as a rule, in hospital.

In the interests of the child, a basket suitably prepared and warmed with hot bottles should be in readiness, also appliances for resuscitation.

Anesthesia and Assistants.—For Cesarean section an experienced obstetric anesthetizer is necessary. Owing to the size of the abdominal tumor the patient often breathes with difficulty during the first stage of the operation. So soon as the uterus is emptied a considerable change occurs in res-

piration and blood pressure. While anesthesia should be complete it should not be so heavily pushed that the patient is deeply narcotized when the child is delivered. Deep narcosis may prevent the prompt contraction of the uterus and may unfavorably affect the child. Ether is the anesthetic of choice, and oxygen should be used freely with it. The vital condition of the patient should receive attention from the anesthetizer and if the uterus is to be retained, a hypodermatic syringeful of ergot should be injected into the thigh or arm so soon as the child is delivered. Strychnia and atropin given hypodermatically are also useful.

In Cesarean section the chief assistant controls hemorrhage by pressure in the manner desired by the operator, and guards against the infection of the peritoneal cavity by amniotic liquid, and by surrounding the uterus with gauze pads wrung out of hot sterile salt solution, stimulates it to contraction. The assistant who receives the child should have ready appliances for clamping, tying and cutting the cord and for resuscitating the child, if necessary.

Many children born by elective Cesarean section do not breathe freely, nor cry for a few moments, because of the suddenness of birth and the absence of birth pressure which accompanies spontaneous delivery.

If the patient is toxemic or exhausted or anemic, it is well to inject into a vein of the arm from 16 to 24 ounces of sterile salt solution. This should be done as the operation is nearing its end. If she has suffered from nausea during her pregnancy and is toxemic, before leaving the operating table the stomach should be gently but thoroughly irrigated with hot sterile salt solution. In performing Cesarean section it is essential, if possible, that the operator should have the advantage of trained assistants who are accustomed to work with him. Much valuable time is saved, and operations are done much more safely and successfully.

Dressings.—After abdominal Cesarean section, where the uterus is left and closed, a firm pad of sterile gauze should be placed upon the fundus, and the abdominal incision covered by a copious gauze dressing. The dressing should be completely covered by broad strips of adhesive plaster applied from above downward and extending two-thirds of the

way around the patient's body. These should overlap so that the dressing is completely enclosed, and firm uniform pressure made. Over this may be placed the ordinary many-tailed surgical binder. A firm abdominal dressing is most important after Cesarean section, as the incision is often a long one; the abdominal walls are relaxed, and unless firm and lasting support be given, in vomiting the patient might burst the abdominal incision and cause a knuckle of intestine to protrude. The usual sterile vulvar dressings should also be employed.

After-treatment.—After Cesarean section the treatment usually given to surgical patients is indicated. Ergot should not be given, but tonic doses of strychnia with or without digitalin, given hypodermatically until the patient is retaining by the stomach, are indicated. Morphia may be used once or twice if necessary, and codein afterward hypodermatically. For gas, enemas of assafetida, and for distention, high purgative enemas, are useful. If vomiting is severe the stomach should again be irrigated. As pregnant patients are usually constipated, it is well to move the bowels on the second or third day by small doses of calomel and soda, followed by a saline and by an intestinal irrigation or high enemas.

Albumen water should be the first nourishment allowed, and other liquids may be given as the patient can take them.

When the patient has recovered from the anesthesia she may nurse the child, and by the second or third day should nurse the child every four or three hours during the day, and once at night. When her digestion is established she should have milk and milk foods in abundance, cereals, cooked fruit, and vegetables in season.

On the average, the stitches may be removed from the tenth to the fourteenth day, and the patient allowed to be out of bed at the end of the second week, and if she has good care at home may leave the hospital at the end of the third or fourth week.

The Care of the Child.—At birth, attention must be given to secure the establishment of respiration, and when this is accomplished the Cesarean child needs none but the usual care. Until it obtains nourishment from the mother it may be given albumin water or a diluted formula of modified

milk. As it may lack the mother's colostrum, the intestine should be irrigated with equal parts of boiled water and salt solution, and meconium brought away as soon as possible.

If the child has been subjected to birth pressure through long labor or is exhausted through maternal hemorrhage, it may require stimulus and artificial feeding.

Complications.—Where pathological conditions of the uterus or pelvic and abdominal tissues exist, abdominal Cesarean section may be complicated by unusual hemorrhage at the time of delivery. In 165 operations the writer has seen this happen three times, once because the intestine had become adherent to the broad ligament where the veins were greatly enlarged, and as the uterus lessened in size after delivery the broad ligament was torn and hemorrhage ensued. It was promptly controlled by suture.

In another case, where the uterus contained fibroid tumors there was unusual hemorrhage when the uterus was incised, which was controlled by hysterectomy, which had been selected as the method of operation before the abdomen was opened.

In a third case, in terminating abdominal Cesarean section by hysterectomy, a clamp burst an enlarged vein in the broad ligament, and during convalescence a hematoma formed which was subsequently evacuated by vaginal incision.

In none of these cases did the complications seriously jeopardize the patient's recovery.

The veins of the broad ligaments are enormously distended at full term, and care must be taken in operating not to wound them or bruise them.

The placenta is frequently under the incision through the uterine wall. At first sight, this causes considerable bleeding, but if the operator disregards the first flow it is questionable whether any essential increase in blood loss actually occurs. Possibly the danger of infection is greater because the large uterine sinuses are closed by the uterine sutures, and should one of these sutures be infected the danger to the patient would be greater.

So far, in the writer's experience, he has been able to cause the uterus to contract efficiently, and has not seen postpartum bleeding after Cesarean section.

In cases where the child is unusually large, the uterine incision may be torn during delivery, and very rarely it is necessary to perform hysterectomy. Death has followed delivery by Cesarean section, because catgut stitches buried in the uterine muscle became loosened and fatal hemorrhage followed. Neither of these complications has come under the observation of the writer.

The complication most to be feared is septic infection. This kept the mortality of delivery by abdominal Cesarean section so high that for many years the operation was in discredit. At present we know that every vaginal examination and every attempt to deliver during labor causes infection in some degree in a parturient patient. It is practically impossible to manipulate the cervix without carrying bacteria from the vagina into the cervix. Operators then fear especially those cases brought to them from the practice of others, where repeated examinations have been made and attempts at delivery carried out under unfavorable surroundings and with very indifferent antiseptic technic. All such patients must be considered as infected, or at least as suspected cases. Where the operator finds the membranes discolored and the amniotic liquid offensive at operation, he recognizes intra-amnial infection as present. In both these classes of cases it is sometimes difficult to decide what is best in the interests of the mother. Unquestionably in suspected and infected cases, the mother is safest if the body of the uterus and Fallopian tubes are removed after delivery; but in young women this seems an excessive procedure, and the writer has had good results by irrigating the uterus thoroughly with hot salt solution and packing and draining it with 10 per cent. iodoform gauze. These patients have a moderate rise of temperature for several days after the operation, but have recovered, retaining the uterus in sound condition.

Where cases are brought to operators where one or more unsuccessful attempts have been made with forceps, the patient having been long in labor and the child subjected to birth pressure and forceps pressure, it may be wise to decline abdominal Cesarean section of any variety and to terminate labor by craniotomy or some other form of embryotomy. Delivery through a peritoneal fistula following labor, leaves

the mother with a tedious convalescence and with the uterus adherent to the abdominal wall.

Results of Abdominal Cesarean Section.—At present, in the hands of experienced operators, clean cases subjected to abdominal Cesarean section should not have a maternal mortality exceeding 2 per cent., and a fetal mortality of practically nil. From this standard the mortality rises steadily in proportion with the number of examinations and attempts at delivery made before the operation, the length of time occupied in operation, the amount of previous hemorrhage, the method of operation selected, and the presence or absence of infection.

The classic abdominal section can be done from the incision through the skin to the completion of the dressing in a considerable series of cases in thirty-five minutes. Hysterectomy by the Porro method is not longer, and often slightly shorter. Elective hysterectomy, removing the tubes, is somewhat longer.

No greater mistake can be made than to deliver a septic patient by abdominal Cesarean section, performing hysterectomy, and then dropping the stump. Such patients in a large proportion die from sepsis. The complete removal of the septic uterus was ideally the operation of choice, but practically extirpation of the uterus at full term is not easy and is often accompanied by considerable hemorrhage, and the results are not so good as those obtained by hysterectomy with the stump outside the peritoneal cavity. A fatal mistake would be made by an operator who performed abdominal Cesarean section upon a septic case where sepsis was unquestionably present, and sutured and left the uterus. So, in dealing with the fibroid uterus, if the incision cannot be made through sound tissue the body of the womb must be removed. If there is ample space for incision through sound tissue, and the fibroids are small, the uterus may often be left and the fibroids may undergo involution.

In general, it may be said that two-thirds of septic cases, where abdominal Cesarean section is indicated, can be saved by hysterectomy with the stump outside the peritoneal cavity. In placenta prævia, where the whole or the greater part of the cervix is covered by placental tissue, and the

patient is uninfected, having had no vaginal manipulation nor packing, abdominal Cesarean section gives good results and instantly stops the hemorrhage. Up to the present time, the writer has performed abdominal Cesarean section on 18 cases of placenta prævia with the recovery of all the mothers. To be successful in placenta prævia and separation of the placenta, abdominal Cesarean section must be done promptly and before repeated examinations and manipulations have been practised. To obtain this result such cases must be sent to hospital on the appearance of the first considerable hemorrhage. Vaginal Cesarean section is contraindicated in placenta prævia because the incisions are made through the site of the placenta, which is unusually vascular, and the condition of which invites infection.

In eclampsia methods to secure elimination, by bleeding and transfusion, gastric lavage and calomel, and intestinal irrigation, are first indicated. With an undilated or undilatable cervix abdominal Cesarean section offers a fair prospect of success.

The success of abdominal Cesarean section lies in its prompt employment in properly selected cases. To obtain this the complications of labor must be considered as seriously as appendicitis or ruptured ectopic gestation, and cases of complicated labor must be sent promptly to hospital.

The field of vaginal Cesarean section lies in the earlier months of pregnancy before viability, and in cases where prompt delivery is required and where the cervix is undilated.

CHAPTER XXV

ENLARGEMENT OF THE PELVIS

Symphysiotomy; Pubiotomy; Lessening the Size of the Sacral Promontory

Where moderate disproportion exists between mother and child, it is possible by severing the pelvic girdle, or by lessening the size of the sacral promontory, to gain sufficient space to permit delivery.

SYMPHYSIOTOMY

If the tissue between the two halves of the pubic joint be cut, and the ligamentum arcuatum or subpubic ligament be severed, the two halves of the pelvis separate, rotating at the sacro-iliac joints. From ½ to 1½ cm. is gained in the oblique diameters of the pelvic brim, and from ½ to 1 cm. in the antero-posterior diameter. This operation is known as symphysiotomy.

Indications.—The object of symphysiotomy is to save the life of the child without damaging the mother. If the pubes be severed in a primipara in whom the birth canal is not dilated and is not readily dilatable, the bringing of the child's head through the undilated vagina may result in serious laceration. The tissues about the cervix and upper portion of the vagina may be brought forcibly against the cut ends of the pubes, and extensive laceration sometimes extending into the pelvic cavity and accompanied by severe or fatal hemorrhage may result.

Hence symphysiotomy is not indicated in primiparæ or in patients where the birth canal is undilated or undilatable. It finds its best success in multiparæ where disproportion between mother and child is not great; where mother and child are in good condition; and where the head of the child is presenting in a favorable position.

An example of a case appropriate for symphysiotomy would be a multipara, who in her third or fourth pregnancy was found to have a child so large that it could not be born without great difficulty through the pelvis. The enlargement obtained by symphysiotomy might permit the birth of such a child.

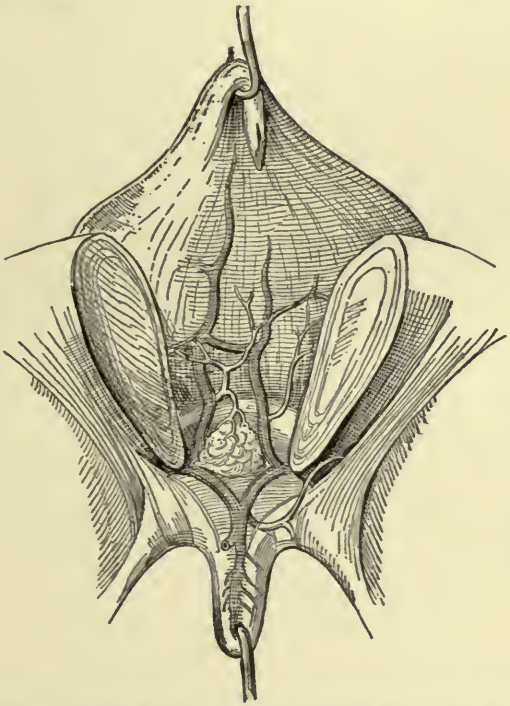

Fig. 148.—Symphysiotomy: the symphysis laid open, showing the bladder and the veins which may be wounded in forcible delivery after the operation.

The Method of Performing the Operation.—The method usually employed is that known as the subcutaneous. It consists in making an incision just above the pubes from one to two inches in length longitudinally. The bladder should previously have been emptied by catheter, and a catheter or sound placed in the urethra, and the urethra carried out

of the median line to one side. With the fingers of the gloved hand the loose connective tissue between the pubes and the peritoneal sac is invaded, the peritoneum pushed upward, and the urethra and bladder to one side and the fingers are passed beneath the pubic joint. Guided by them, a blunt-pointed bistoury, or a strong sickle-shaped, blunt-pointed knife, is passed beneath the joint, and the cartilage is severed from behind forward, and from above slightly downward. When this is done, the ends of the pubes separate somewhat, but this is not complete until the subpubic ligament is severed. To accomplish this the same knife may be employed, or a bistoury or scalpel guided by the fingers. When the joint is completely cut through, the two halves of the pubes at once separate, so that from two to three fingers can be placed between them.

Some prefer to sever the symphysis after making the incision through the skin above the joint, by a chain saw passed about the pubes, or by a strong scalpel guided by vision, to the fingers behind the joint.

Others have preferred to cut down upon the joint from in front, and passing the finger from below upward behind the joint, to guard the tissues while the joint is opened. This by some has been called the open method.

Various instruments have been used in symphysiotomy, a fine wire saw and the metacarpal saw being the least often used.

Delivery after Symphysiotomy.—As the operation is not performed until the cervix is dilated, the operator may proceed at once to complete delivery. The head is usually found in the pelvic cavity or on the pelvic floor, and in many cases the occiput is posterior. For delivery, the patient is placed upon her back at the edge of a table, with the limbs flexed, and the two halves of the pelvis are steadied and supported by assistants. Delivery is effected by forceps, and care must be taken not to make traction upward, to avoid wounding the tissues against the cut edges of the pubes. After the delivery of the child, the placenta, membranes and cord are expressed and the uterus packed with iodoform gauze. Especial care must be taken to inspect the cervix and the tissues about the cervix, and lacerations should be

immediately closed with chromicized catgut. The region about the urethra and the clitoris should be examined carefully, for lacerations sometimes occur in these tissues which may cause annoying or even dangerous hemorrhage. A small gauze drain is placed in the symphysiotomy wound and the balance of the wound closed by sutures, the pelvis is immobilized by a broad strip of adhesive plaster passed over the trochanters and over the pubes and sacrum. If the urethra has been bruised during delivery, or if there is reason to fear that the base of the bladder has been injured, a permanent soft catheter should be left in the bladder.

The Results of Symphysiotomy.—In favorable cases connective tissue forms between the halves of the pubes sufficiently firm to keep the pubes in comparatively good apposition. Bony tissue rarely develops, nor does the joint assume its former characteristics. Some motion may be present between the halves of the pubic bone for some time after the operation.

If the delivery has been difficult, one or both sacro-iliac joints may be strained during delivery, and the patient may have pain and disability in that region. The pelvis after symphysiotomy remains permanently enlarged, but in a small degree only.

Some patients' convalescence is retarded by inability to walk, for which no anatomical cause can be found. Patients are kept in bed from two to three weeks, and when they begin to walk, wear for a short time a strong canvas belt.

PUBIOTOMY

The pelvic girdle may be opened by severing the pubic bone through the ramus of the pubes and not at the joint.

Indications for Pubiotomy.—The same indications which pertain in symphysiotomy are applicable for pubiotomy. The operation has the same indications and the same dangers which symphysiotomy has demonstrated.

Methods of Performance.—Pubiotomy is most often done by passing a needle upon a handle behind the pubic bone and causing it to emerge at the edge of the ramus of the pubes. A silk ligature may be used from the needle to draw a fine wire saw through the opening thus made. The pubic bone

Fig. 149.—Pubiotomy. Introducing the curved needle beneath the ramus of the left pubes (Liepmann).

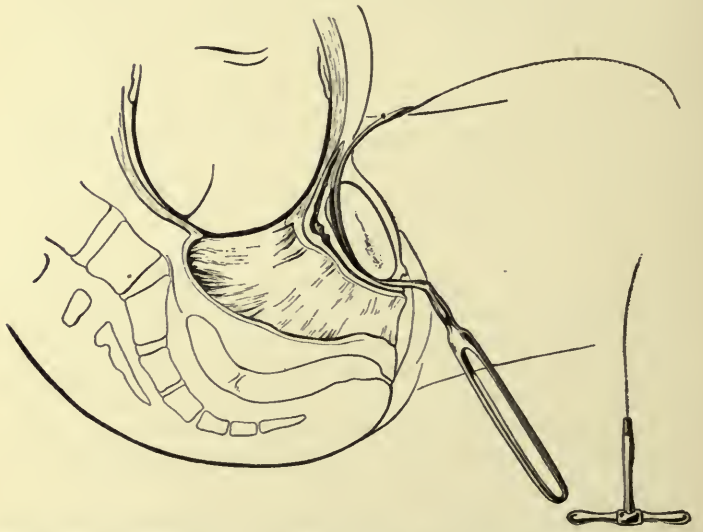

Fig. 150.—Pubiotomy. The fine saw is drawn through with which the pubic bone is severed (Liepmann).

is severed by the saw, and the saw withdrawn. The small openings are closed by a single stitch or by collodion.

Some have preferred the open method, cutting down upon the bone, and passing the saw with the aid of vision and touch. The left half of the pubes is usually selected for section, as the presenting part was originally directed toward this point. The pelvis separates after pubiotomy, as it does after symphysiotomy, and delivery is effected in the same manner. The pelvis is immobilized, and the patient usually kept in bed from ten days to two weeks. In favorable cases sufficient union results to enable her to resume her usual mode of life in three or four weeks.

Pubiotomy as a Prophylactic Measure.—In cases where moderate disproportion is present, but the operator believes that the head can be brought through the pelvis with but slight enlargement of the pelvic brim, the fine wire saw may be applied to the pubic bone before traction is made by the forceps. A tentative traction by forceps is then cautiously carried out, and if the head does not descend readily the pubic bone is severed.

In selected cases the results of symphysiotomy and pubiotomy are good for mother and child. These operations have but a narrow field, as the conditions necessary for their successful performance are not often encountered. They are incompetent to deal with the more important complications of parturition, and both operations are less practised now than formerly. For the child, both are life-saving operations, and unless an error has been made in estimating the comparative size of the fetus and the pelvis, these operations should give good results.

ENLARGEMENT OF THE PELVIS BY LESSENING THE SIZE OF THE PROMONTORY OF THE SACRUM

To increase the anterior-posterior diameter of the pelvic brim a portion of the promontory of the sacrum has been removed by operation. A considerable gain in this diameter results. The operation is too recent at present to give a definite idea of its value.

Mercurio's and Walcher's Position.—It is possible to enlarge somewhat the capacity of the pelvic brim by placing

the patient in Mercurio's or Walcher's position. This consists in placing the patient upon her back at the edge of a high padded table, so that the trunk of her body rests upon the posterior surface of the sacrum. The table should be so high that when the patient's lower extremities are allowed

Fig. 151.—Delivery of patient in Walcher's position with axis-traction forceps.

to hang freely, the feet do not touch the floor. The patient is kept in this position by two assistants, who grasp the sides of the pelvis. The weight of the thighs, if the lower extremities are rotated outward, is sufficient to cause the two halves of the pelvis to rotate at the sacro-iliac joints, thus en-

larging the oblique diameters of the pelvic brim. If the forceps be applied with the patient in this position it is possible to make traction downward and backward at the pelvic brim to advantage, and thus to deliver some cases where otherwise craniotomy would be necessary. As the head of the child comes upon the pelvic floor the thighs should be flexed and drawn upward upon the patient's abdomen. This will relax the tissues at the outlet of the pelvis and tend to prevent serious laceration.

Mercurio's position is most successful in young patients in whom the pelvic joints are mobile and in whom the tissues are elastic. It requires two strong assistants to hold the patient upon the table, as she must be placed so far over the edge that if care were not taken she would be pulled off from the table by the weight of the thighs.

CHAPTER XXVI

RUPTURE OF THE UTERUS

This serious and often fatal accident may occur during spontaneous labor, in the early months of gestation, or during the performance of some method of operative delivery.

Etiology.—The uterus ruptures because its muscle is diseased or over-distended, or through violence applied in unskilful efforts to effect delivery.

Signs and Symptoms of Uterine Rupture.—In the early months of pregnancy, where no interference has been practised, rupture of the uterus may not be immediately discovered. The escape of the uterine contents into the pelvic and peritoneal cavities will be followed by signs and symptoms of infection.

An accurate diagnosis can rarely be made in these cases unless operation is performed, the abdomen opened, and the uterus directly inspected.

When the uterus ruptures during labor the symptoms are characteristic and significant. The patient experiences sudden sharp pain in the abdomen followed by shock. The characteristic contractions of the uterus in labor at once cease. The patient's pulse becomes rapid and weak, and unless prompt measures are taken, signs of infection soon develope.

Where the patient is under anesthesia, and vaginal delivery is accomplished, rupture of the uterus may not be known until the operator introduces his hand to remove the placenta, when the hand may pass through the uterine wall at the point of laceration, or when the intestine may be found prolapsed through the tear into the uterine cavity.

Signs of Threatened Uterine Rupture.—In cases where spontaneous parturition is impossible, as in shoulder presentation, brow presentation, abnormally large child and mod-

erately contracted pelvis, the lower segment becomes enormously stretched by the contraction and retraction of the upper segment. The lower edge of the upper segment can be felt as a distinct ridge, which slowly proceeds upward in the abdomen of the patient as the distention of the lower segment increases.

Fig. 152.—Rupture of the uterus by the left blade of the forceps (Liepmann).

This ridge is often called Bandl's ring, from the name of the author who first drew attention to it.

The condition of the uterine muscle during prolonged labor is often a valuable indication of threatened rupture. In normal labor the uterus contracts and relaxes, but when the uterus becomes over-distended it passes oftentimes into a tetanic condition, in which the uterus feels firm and resisting

upon palpation, is painful on pressure, and prevents effectually the recognition of the position and presentation and heart sounds of the fetus. This condition of uterine tetanus points to the distended state of the lower segment, and is a valuable indication of threatened rupture.

The Results of Uterine Rupture.—In shoulder presentation, transverse position, the uterus usually tears obliquely or transversely across the anterior surface. In other abnormal positions and presentations the direction of the tear varies in accordance with the circumstances present. Occasionally the uterus tears longitudinally.

Rupture of the uterine wall is followed by the escape of some of the uterine contents into the pelvic or abdominal cavity. Where the rupture is slight in extent and not complete, a loop of cord may escape or one of the fetal limbs. Where the rupture is transverse or oblique, and extensive, the entire uterine contents may be found in the pelvis and abdomen. In other cases only the greater portion of the body of the child may escape. The result of the escape of the uterine contents into the pelvic or abdominal cavities is infection. Hemorrhage varies in accordance with the extent, direction, and location of the injury. It is often severe enough to greatly prostrate the patient, and to assist in the development of infection. Death must inevitably follow uterine rupture, if extensive, because fetal death occurs, the placenta becomes a foreign body, and infection is inevitable.

The Prevention of Uterine Rupture.—In cases where the obstetrician has reason to believe that the uterine muscle is abnormal through degeneration or infection, especial care must be exercised in all intrauterine manipulations. Thus dilatation, curetting to remove the products of early gestation, the performance of version, or even the introduction of the hand to remove the placenta, should be practised with great caution in infected or degenerated cases.

To avoid the danger of uterine rupture, cases where unfavorable position and presentation develop should not be allowed to go on without correction. Thus prolapse of the hand with transverse position, shoulder presentation, should be removed as soon as possible. Brow presentation, face with chin posterior, transverse position, and posterior occiput,

should all receive prompt attention. In cases where the contraction ring is present with transverse position shoulder presentation, or other oblique and complicated positions, the obstetrician must exercise great caution in attempting delivery. Version in any form is especially dangerous in proportion to the distention of the lower uterine segment and the firm contraction of its upper portion. While the tetanic grasp of the uterus can be somewhat relaxed by complete anesthesia, sometimes aided by morphia, if the child be large this cannot be relied upon to permit the safe performance of version. In these cases embryotomy must be chosen to save the mother at the expense of the child. In prolapse of the arm and shoulder the fetal body forms a wedge which is forced into the pelvic brim, making descent impossible. This wedge must be decomposed by amputating the shoulder, severing the clavicle, or by performing decapitation. In some cases delivery by abdominal section becomes necessary, and is much safer than embryotomy, followed by vaginal delivery.

To prevent rupture of the uterus during the performance of obstetric operations care must be taken to apply the forceps properly and to make traction invariably in the axis of the birth canal. In cases where the head is evidently large the patient should not be allowed to continue in labor without distinct progress.

Treatment.—In the presence of uterine rupture the first indication is to bring the patient quickly to hospital. As a capital operation may be necessary, the surroundings of a hospital are absolutely required for successful treatment.

An examination should then be made to determine the possibility of extracting the child through the vagina without enlarging the injury to the uterus. If the head is in the pelvic cavity the patient should be anesthetized, prepared for abdominal section, and the child delivered carefully through the vagina. If it is found that the effort to extract the fetus through the vagina may enlarge the rent in the uterus, vaginal delivery must not be attempted.

If it is possible to deliver the patient through the vagina, and the placenta, membranes and cord are thus delivered, the uterine cavity should be carefully palpated with the

gloved hand to determine the location and extent of the rupture. If this be found longitudinal or through the contractile portion of the uterus, and not of great size, and if it has not been possible to transport the patient to hospital, the obstetrician may make an effort to save the uterus and to avoid abdominal section. For this purpose a strip of iodoform gauze nine inches wide and four yards long should be carried with the fingers of the gloved hand cautiously through the point of rupture so that several inches of the gauze project into the pelvic or abdominal cavity. The amount of gauze carried through should depend upon the size of the tear. The remainder should be used to tampon the uterine cavity, the whole acting as an antiseptic drain. The patient should be given strychnia and ergot hypodermatically, and an ice bag placed upon the abdomen. Morphia should be used sufficiently to quiet pain, the bladder should be emptied by catheter, and the digestive organs of the patient should receive attention.

If it is not possible to extract the fetus through the vagina, or if after such extraction a large transverse rent is found, the abdomen must be opened as soon as possible.

Unless the rent is small, longitudinal, and situated in the expulsive segment only, the effort to save the uterus by suturing its lacerated edges cannot be successful.

The choice lies between extirpation of the uterus or hysterectomy. Those who practice extirpation claim that by this method the principal danger following this accident, namely, septic infection, is more successfully avoided. Those who practice hysterectomy avoid the dangers of total extirpation.

If much of the uterine contents has escaped into the pelvic or abdominal cavities, drainage should be employed after hysterectomy. If septic infection has evidently developed the uterine stump should be left outside the peritoneal cavity, either by the Porro operation, with the clamp, or by stitching the stump in the lower end of the abdominal incision. Intravenous saline transfusion, the hypodermatic use of strychnia, digitalin and atropin, stimulating enemata, artificial warmth, and the Faradic current, may all be necessary.

In cases where unskilful and improper efforts at vaginal delivery have been made and where the abdominal cavity is subsequently opened, the obstetrician may find partial or complete rupture of the uterus extending along the bases of one or both broad ligaments. Considerable extravasation of blood follows this accident, and it is sometimes difficult to control the source of the bleeding.

Prognosis.—The fetus is inevitably lost in rupture of the uterus. The mother's chance for recovery depends upon the extent and situation of the rupture and the prompt use of surgical measures for her life. The majority of cases require abdominal hysterectomy as soon as possible. While under antiseptic precautions, and with gauze drainage, the mortality of the milder cases may not exceed from 15 to 25 per cent. in severe rupture the mortality with operation may reach 30 and 40 per cent.; without operation 100 per cent.

Rupture of the Uterus Followed by Injury to the Intestine.—In cases where extensive rupture of the uterus has occurred, and the intestine has prolapsed, a considerable portion of the bowel has been removed ignorantly because the attending physician did not recognize the situation. While the majority of these cases are fatal, the effort should always be made by immediate operation, to resect the torn intestine, with the hope of saving the patient.

PART VI

THE FETUS

CHAPTER XXVII

FETAL PATHOLOGY

Abnormalities in Size.—The fetus naturally resembles in size the parents, when both are similar in stature. The height of the mother is not an index of the size of her fetus, for a short woman with broad hips and shoulders may produce a large child, if the father of the child be well developed. The lack of development in either parent may be transmitted to the fetus. The average male fetus weighs between 7 and 8 lbs. at birth; the average female fetus between 6½ and 7½ lbs. at birth. Children weighing 10 lbs. at birth are not rare, but those weighing 15 and 20 lbs. are seldom accurately reported. The stature and development of the parents determine that of the fetus, and the hygienic conditions which surround the mother during her pregnancy. In healthy females, where there are several children, the size of the children tends to increase after the second child, until the mother approaches the menopause. The occasional appearance of dwarf children in families otherwise of average size cannot readily be explained. These individuals are often perfectly formed, but are usually deficient in mental and physical vigor. It is a familiar fact that male children often resemble the mother and female children the father, in physical and mental characteristics.

To estimate the comparative size of the fetus in the uterus, palpation is the most valuable method. This should be accompanied by bimanual vaginal and pelvic examination, the

comparative size of the head and the pelvis being ascertained by pressing the head downward and backward into the pelvic brim. The length of the fetus may be measured by introducing one limb of the pelvimeter into the cervix against the head, and placing the other on the abdomen over the fundus of the uterus. This method is not strictly accurate, but gives information of value.

In estimating the size of the fetal cranium, rhachitis and hydrocephalus must be eliminated if the head is large. In cases where it is necessary to obtain accurate knowledge concerning the size of the fetal cranium, examination by the X-ray is often satisfactory.

MONSTROSITIES

In cases where the mother is subjected to great mechanical and mental disturbance during early pregnancy, malformation may result in deformity of the embryo, producing a monster. Where, by accident or design, direct violence is applied to the genital tract or to the ovum, malformation may result. It has constantly been supposed that shock and fright may result in the birth of monsters resembling an animal which may have frightened the mother, or some other object which caused great mental disturbance. It is probable that in these cases some other cause beside the mental disturbance interfered with the development of the ovum.

Classification.—Monsters are commonly divided into hemiteratic, heterotaxic, hermaphroditic, and the monstrous fetus.

By hemiteratic, we understand variations in the volume, form, color, structure, position, number, and existence of organs normally found in the body. Such individuals are the dwarf, the giant, a fetus with diminutive breasts or excessive development of the mammary glands, partial development of the genital tract, deformed pelvis, Albinism, deficient ossification of the skeleton, abnormalities in the bladder, occlusion of the rectum, vulva or vagina, hare-lip, cleft-palate, absence of one kidney or of the uterus, double uterus, or additional digits.

The fetus resembles the normal fetus sufficiently to be recognized, and the various organs can be identified.

The heterotaxic fetus has organs, or groups of organs transposed—probably caused by variation in the arrangement of the different layers of germinal epithelium. In some of these cases the heart is found upon the right side, and other important organs may be in abnormal positions.

Fig. 153.—Autositic monster (after Hirst and Piersol).

The hermaphroditic is a fetus containing the reproductive organs of both sexes. This condition is rarely perfect, but individuals are seen in whom a portion of the reproductive organs of both sexes is present.

The monstrous fetus, or monster, is so distorted that it resembles the normal human being but little. Such may be single or composite—as one distorted individual, or two, joined together.

Autositic Monsters.—These deformed fetuses are still capable of independent existence. The common variety is ectromelus, in which the limbs are lacking or but partly developed. In some the lower limbs are joined, the condition being termed symelus. In others there is failure of development in the brain, the cranium, the eye, or other organs of special senses.

Omphalositic Monsters.—These monsters have such deformities or abnormal development of the head, the thoracic viscera, or the limbs, that make their life impossible when the umbilical cord is severed. In these the important nervous centres may be lacking, or the heart may be but partly

developed, or the blood vessels abnormal in their arrangement.

Composite Monsters.—Composite monsters are produced by the union of two or more already described. Of these, the most familiar example is conjoined twins. The Siamese twins, two males connected by a band of connective tissue

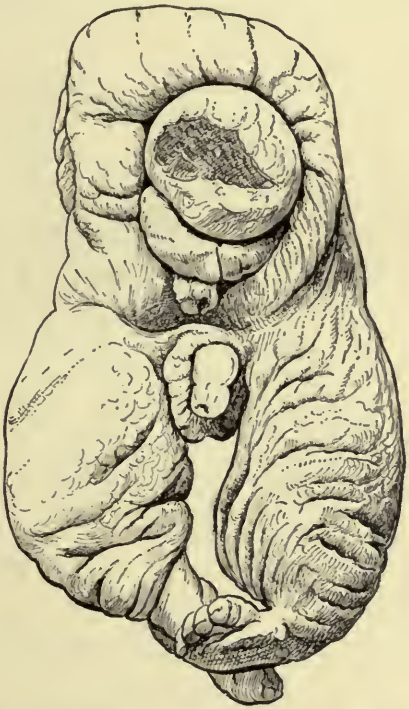

Fig. 154.—Omphalositic monster (after Hirst and Piersol).

containing blood vessels, lived to be adults, and were frequently exhibited.

Conjoined twins came under the observation of the writer some years ago. They were joined by a band extending from the ensiform cartilage to a point midway between the ensiform and the symphysis pubis in each fetus. There was

one common umbilicus containing one vein, four arteries, and one urachus. The urachus bifurcated after entering the umbilicus, each portion passing to the summit of the bladder in each fetus. The livers of both were joined, the umbilical vein passing beneath the common liver. One branch of the vein passed to the vena cava of one fetus; the other passed through one portion of the liver in the connecting band to the vena cava of the other child. There were other abnormal

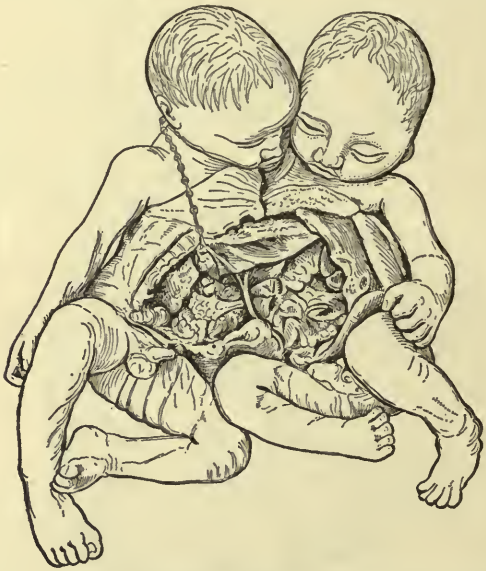

Fig. 155.—Conjoined twins (after Davis: Treatise on Obstetrics).

unions between various important organs which would have rendered the separation of the children had they lived, impossible.

Diagnosis of Monstrosities.—Palpation and vaginal examination as labor proceeds will often make possible the diagnosis of monstrosities. If such are small in size the amniotic liquid may be in excess, and the diagnosis not be made until the child is born.

In conducting labor in these cases the clinical rule prevails

to sacrifice the monster in the interests of the mother. Embryotomy, in any form necessary, is the treatment indicated. Where the uterus is in tetanic contraction and rupture is threatened, delivery by abdominal section may be necessary in the interests of the mother.

Hydrocephalus.—In external hydrocephalus the cranium is distended by fluid external to the brain proper between the

Fig. 156.—Hydrocephalus: perforation of the head to deliver (Liepmann).

meninges and the cranium. In internal hydrocephalus the fluid accumulates within the ventricles of the brain. These two conditions are often present in the same fetus.

Abnormal states of the amnion and abnormal conditions in the mother producing dropsy, may be followed by hydrocephalus.

The diagnosis is made by the great size of the fetal head on palpation and by finding the head smooth and elastic on vaginal examination, with the sutures and fontanelles greatly increased in size or obliterated.

Treatment.—The effort is sometimes made to evacuate the fluid by tapping the spinal column at the base of the cranium. If this can readily be done it may be attempted, but as the hydrocephalic fetus is deficient in vitality, no effort should be made to save its life, if the interests of the mother demand its destruction.

The Management of Labor where the Fetus is Excessively Developed.—If there is no reason to suspect deformity, but the fetus is of unusual size and vigor, and engagement and descent do not occur, the mother being in good condition, the child should be delivered by abdominal section. If the surroundings make this unsafe, or if there is reason to suspect malformation, embryotomy must be performed. Where the shoulders are excessive in size, one or both clavicles may be severed by strong blunt-pointed scissors, the operation being known as cleidotomy.

Fetal Tumors.—The birth of the fetus and the continuing of its life may be rendered impossible by tumors in the abdomen, thorax, cranium, or in other portions of the body. Where abdominal tumors are present the fetal abdomen should be opened with blunt-pointed scissors, the contents of the tumor evacuated, and delivery effected by extraction. In other cases embryotomy must be performed as the conditions permit.

Polyhydramnios.—The average quantity of amniotic fluid is one quart. Where disease of the amnion is present, or the mother suffers from disease of the organs of digestion, or circulation fluid may accumulate in the amniotic sac, polyhydramnios may develop.

Diagnosis.—In these cases the abdomen increases rapidly in size, especially after the sixth month. Fetal heart sounds are heard faintly or not at all; fetal movements are often indistinguishable. The mother suffers from increasing abdominal pressure, with disturbance of respiration and heart action, and the functions of the bowels and bladder. Sleep

becomes difficult and the mother cannot move because of the excessive weight.

Differential Diagnosis.—Polyhydramnios has been mistaken for ovarian cyst, abdominal dropsy, ectopic gestation, multiple pregnancy, and hydatid mole.

In ovarian cyst there is a history of comparatively slow growth, the tumor remains unilateral, pregnancy may or may not be present, and the characteristic signs of pregnancy are absent or may be obscured.

In abdominal dropsy the fluid gravitates with change in the posture of the patient, and uterine dullness upon percussion is absent.

Multiple pregnancy may be complicated with polyhydramnios when the diagnosis is difficult. If polyhydramnios be not present, two heart sounds or two heads can usually be made out.

In ectopic pregnancy the resistance on percussion is not so much fluid as solid, and the history indicates ectopic gestation.

In hydatid mole the tumor is not fluid, and the uterus is usually pear-shaped in contour, and does not give the sensation of fluid upon percussion.

Complications Produced by Polyhydramnios.—In these cases the mother rarely goes to full term, and labor is brought on by the over-distention of the uterus. Without pain a large amount of fluid is discharged, followed by a period of quiet, and the rapid birth of one or two small children. Collapse of the cord, abnormal presentation and position, relaxation of the uterus, and hemorrhage, may result.

The Treatment of Polyhydramnios.—So soon as it is evident that the fluid is accumulating steadily, pregnancy must end. This should be accomplished by rupturing the membranes, if possible, high up and allowing the fluid to escape as slowly as possible. Abdominal pressure should be maintained by a firm many-tailed bandage closely applied. The expulsion of the fetus is usually sudden in these cases, and not preceded by much pain.

Strychnia and ergot should be given afterward and, if necessary, intra-uterine tamponing should be practised.

As the fetus is ill-developed, unusual care is necessary to

prolong its life. In many of these cases the fetus is malformed and does not long survive.

Oligohydramnion.—By this term is understood a lessened quantity or absence of amniotic liquid. This is usually accompanied by malformation of the fetus. The placenta often shows abnormalities with infarcts and sclerosis of its vessels.

The diagnosis is usually made by the small size of the uterine tumor, the delay in dilatation during labor, and the deficient quantity of fluid which escapes when the membranes rupture.

Fetal Death.—Pathological conditions which destroy the placental circulation, or which occlude the umbilical cord, are the most common causes of fetal death. The mechanism of this death is asphyxia. Where the cord is suddenly occluded, the death of the child is preceded by violent movements, which may cause the mother considerable pain. Fetal death is diagnosticated by the cessation of fetal heart sounds and movements, and by the diminution in size of the uterus, caused by the absorption of the amniotic liquid.

This condition rarely requires treatment, as the fetus is expelled spontaneously sooner or later. If it is thought best to empty the uterus the rupture of the membranes is usually sufficient.

Fetal Infection.—Abundant clinical observation shows that the fetus may share with the mother, variola, vaccinia, measles, scarlet fever, typhoid, malaria, tuberculosis, rheumatism, septic infection, and other acute infections.

The diagnosis of these conditions is made by their presence in the mother, and the pathology and treatment are essentially those of the disease in the mother. These diseases are transmitted by bacteria which make their way through the placenta into the fetal circulation.

Fetal Syphilis.—The Spirochæte may attack the fetus, producing characteristic changes.

The Placenta.—The syphilitic placenta is larger and paler than normal, reddish in color with areas of grayish-white or yellow. It is abnormally soft and often friable. It is lighter in weight than the healthy subject.

Microscopic examination shows degeneration of the villi, endarteritis and thrombosis. The circulation of the placenta

is gradually destroyed by the disease. The vessels of the umbilical cord are greatly thickened; the amniotic liquid is often in excess, and syphilitic lesions in the heart and lungs may be present. The liver shows diffuse interstitial sclerosis, and a similar process is present in the lungs, where gumma are sometimes found. The glandular organs show the characteristic lesions and the long bones exhibit a layer of yellow tissue between the shaft and the epiphysis. This is

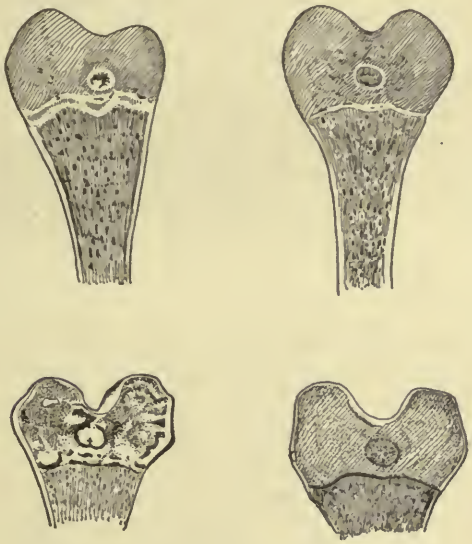

Fig. 157.—The femur of a syphilitic fetus.

especially well marked in the femur. Pemphigus and ichthyosis are often present.

If the fetus survives its birth it develops a red coppery staining about the anus and genital organs, an earthy, gray-colored complexion, redness of the mucous membranes, chronic nasal catarrh, and a wasted and flabby condition of the tissues. The bones become altered and softened and the contour of the fetal cranium may be greatly changed. The nervous system suffers proportionately.

Diagnosis.—The diagnosis of syphilis in the living fetus is usually made by the condition of the skin, the malnutrition present, and the characteristic general appearance of the child. The Wassermann reaction is usually positive. If the fetus comes to autopsy the characteristic lesions are usually evident.

Colles' Law.—By clinical observation, Colles was led to enunciate the belief that an apparently healthy mother giving birth to a syphilitic child may nurse that child without incurring a chancre upon the breast; in other words, she seems partially or wholly immune. While there are exceptions to this rule, it is usually true.

Mortality and Morbidity.—Extensive observations show that when syphilitic infection occurs in the mother before conception, the mortality of the fetus born afterward is 65 per cent., the morbidity 70 per cent. When conception preceded infection, the fetal mortality was 39 per cent., the morbidity 72 per cent. When specific infection and conception occurred simultaneously, the mortality of the fetus was 75 per cent., the morbidity 91 per cent. The mortality is modified somewhat by the transmitter. Where the father alone is syphilitic, the fetal mortality is 28 per cent., the morbidity 37 per cent. If the mother alone be syphilitic, the fetal mortality is 60 per cent., the morbidity 80 per cent. Where both father and mother are syphilitic, the fetal death-rate is 68.5 per cent., the morbidity 92 per cent.

Treatment.—The treatment of syphilis in the fetus is the treatment of the mother. Salvarsan, mercury, iodide of potassium, tonics, careful feeding, and good hygiene, are all indicated.

Fetal Tuberculosis.—The tubercle bacillus may penetrate the placenta and attack the fetus. The lesions which it produces correspond closely to those which are found in the adult person, the tubercle bacilli being usually demonstrable in the placenta.

While fetal death from tuberculosis is rare, the disease may develop actively at any time after birth.

Alcoholism.—The use of alcohol on the part of the parents is one of the most potent causes of impaired development and death in the fetus. The injurious effects of alcohol are

PLATE II

Gonorrheal infection in the mouth of the fetus at birth (Rosinski).

seen especially in the nervous system of the child, producing idiocy, epilepsy, imbecility, hysteria, and insanity.

The statistics of the asylum show that at least 40 per cent. of these cases had drunken parents. A fetus born of drunken parents is deficient in development, badly nourished, and falls a ready prey to acute infection.

Gonorrhea.—Gonorrhea in the mother may infect the fetus by the passage of the gonococcus through the membranes. The fetus has been born with gonorrheal patches on the tongue and upon the mucous membranes of the mouth. Gonorrheal ophthalmia may also be present at birth. In these cases nothing can be done in treatment before the birth of the child, and after birth appropriate measures are usually successful.

The Effect of Poisons upon the Fetus.—Lead, mercury, phosphorous, tobacco, chloroform, ether, opium, and poisonous gases, all exert a fatal and unfavorable influence upon the fetus. For this reason pregnant women should not enter occupations where they are exposed to poisonous fumes, or to the absorption of poisons. Poisonous drugs should be used with great caution during pregnancy.

Abnormalities of the Skin.—Areas of dilatated blood-vessels upon the skin produce the characteristic red patches known as birth-marks. They may occur on any portion of the body and are sometimes accompanied by enlargement of the thymus gland. If the child survives and grows vigorous, these patches may spontaneously disappear. In other cases they tend to become larger, and must be treated by the destruction of the vessels, by electricity, radium, or some other escharotic method.

In fetal ichthyosis the body is covered with thick horny yellow plates, the surface beneath being reddish or bluish in color. The epidermis is greatly hardened and thickened, the hands and feet deformed, resembling birds' claws. The vitality of the fetus is greatly impaired and it rarely survives its birth for a long time.

Disease of the Fetal Skeleton.—Where the mother is badly nourished, the fetus may be rhachitic. This is of practical interest to the obstetrician, as the fetal cranium is broader, thicker, and more dense than the normal fetal cran-

ium. The fetal head does not mould during labor, and if the mother's pelvis be contracted, or there be considerable disproportion between mother and child, the occurrence of rhachitis in the fetal cranium may make the birth of a living child impossible.

Failure of development in the fetal bones may occur, giving rise to the belief that the bones have been spontaneously fractured or amputated in the uterus. In most cases maldevelopment is present and not amputation.

Diseases of the Fetal Urinary and Genital Organs.—Chronic nephritis and distention of the fetal urinary bladder and mal-formations of the bladder, are observed. The diagnosis of such conditions is rarely possible before labor, and after labor the vitality of the fetus is often so impaired that its life does not long persist.

Double uterus and vagina, or deficient development in the genital organs of the fetus is not rare. In these cases treatment is unnecessary, and the child should be allowed to grow to puberty before operative interference is indicated.

Imperforate Anus and Urethra.—Children should be examined at birth to detect these conditions. Where the anus is imperforate, malformations of the bowel are present, and it may be found that the rectum is wanting and that the bowel terminates several inches from the usual location of the anus. An artificial anus is sometimes made in these cases, if the child is vigorous and otherwise well developed.

Imperforate urethra in the male may result from tight phimosis. In these cases the prepuce must be stretched or circumcision immediately performed. Occlusion of the urethra in the female fetus is not observed.

Abnormalities in the Fetal Adnexa.—An excessively long umbilical cord may complicate fetal life through coiling about the fetal body. The most frequent site of this condition is the fetal neck, and if traction be made asphyxia may be the result. When the head is born, the obstetrician must always pass the fingers up to the neck to determine the presence or absence of coils of the cord. Should the cord be tightly coiled it must at once be clamped and cut and the fetus extracted as rapidly as is safe. Occasionally the cord may be pulled down gently and slipped over the fetal head and thus loosened.

Although the cord may be normal in length the mother may fall during the latter weeks of pregnancy, when the strain and shock of falling may cause violent fetal movement which coils the cord about its neck. The gradual occlusion of the cord and fetal death may result.

An abnormally short cord may be a source of danger to the child during labor, as it will produce traction upon the placenta and may partly detach it, causing hemorrhage and fetal death. Should there be evidence of this during labor the child must be extracted as rapidly as possible and the uterus promptly emptied.

Rupture of the Umbilical Cord During Labor.—Occasionally in precipitate birth where the child falls from the body of the mother, the umbilical cord may be ruptured. Dangerous hemorrhage rarely results, as the vessels usually retract and stop bleeding. Should the force be sufficient to separate the placenta from the uterine wall, the fetus may die as a result of the hemorrhage.

Fetal death occasionally results through the rupture of veins of the placenta or some of the placental sinuses through diseased conditions of the vessels, or violence occurring during pregnancy. This condition must be inferred by the violent movements of the child as the hemorrhage causes asphyxia to develop.

THE TREATMENT OF FETAL DEVELOPMENT BY DIET AND HYGIENE

Where disproportion has developed in previous pregnancies between mother and child, or the mother's pelvis is slightly contracted, the effort is sometimes made to lessen fetal size by the mother's diet. Diminution in the quantity of the mother's food is not followed by corresponding diminution in the size of the fetus because the fetus lives at the expense of the mother as a parasite. By excluding as much as possible water, soups, potatoes, puddings, sugar, and malt beverages, it has been found possible to lessen the size and development of the child without producing malformation. A limited quantity of tea or coffee is allowed, and a limited quantity of light wine, if desired. The essentials of the diet consist of meat, eggs, fish, green vegetables, salads and cheese.

CHAPTER XXVIII

INJURIES TO THE FETUS IN LABOR

Birth Pressure.—The most common injury which the fetus sustains during labor is birth pressure. While this is present in all spontaneous parturitions, where the fetus advances and recedes normally the pressure is intermittent and the circulation in the fetus adjusts itself to the altered conditions. Where the fetus is forced down strongly upon the pelvic floor in the bony pelvis and remains impacted, the pressure is constant and injury results.

Birth pressure may cause rupture of cerebral vessels with hemorrhage, or rupture of small vessels in any of the large organs of the fetal body, producing parenchymatous bleeding. Thus the fetus may suffer from cerebral or pulmonary apoplexy, or from bleeding into the substance of the liver, spleen or other abdominal organs. Birth pressure may also interfere with the circulation in the umbilical cord, thus depriving the fetus of oxygenated blood and causing involuntary respiratory movements. If the fetus inspires mucus and bacteria from the birth canal, inspiration pneumonia may result. Fetal death is a common effect of birth pressure through hemorrhage, inspiration pneumonia, or in extreme cases from laceration of the cerebral substance or of the membranes covering the brain.

Injurious birth pressure may be inferred when, after the child is delivered, it breathes feebly and irregularly, with a constant moaning or shrieking cry, and when the temperature rises steadily and rapidly after delivery. If hemorrhage is severe the child breathes feebly, the heart action is poor, and death soon follows. Where the child survives birth pressure, some permanent injury to the nervous system may develop through hemorrhage into the substance of the brain, or injury to some other portion of the nervous system.

PLATE III

Hemorrhage into the brain, kidney, spleen, and liver from birth pressure (Spencer).

Asphyxia.—Fetal asphyxia is usually divided into two classes—pallid and livid. This classification is based upon the color of the fetal face and skin after birth, which is dark reddish-blue in livid asphyxia, and pale or corpse-like in pallid asphyxia. Carbon dioxid poisoning is the essential condition in both. In livid asphyxia, the poisoning is in the first stage, and the child, though blue and dusky in the face, has a distinct heart beat and may make feeble efforts at respiration. Its reflexes are still present, and if the finger be moistened with salt water or with whiskey and introduced into the mouth the child will usually suck on the finger. If the action of the heart is maintained, and air is brought into the lungs, the majority of these cases will recover.

In pale or pallid asphyxia, the carbon-dioxid poisoning has gone so far that the vital centres are paralyzed and the action of the heart is almost completely suspended. Many of these cases are beyond treatment when the child is born, and react but feebly to any sort of stimulation. In many cases the reflexes are absent, the sphincters relaxed, the heart beat is exceedingly feeble, or cannot be detected.

The Causes of Asphyxia.—Whatever interferes with the circulation of the umbilical cord or deprives the placenta of oxygenated blood will produce asphyxia—so coiling of the cord, occlusion of the cord by pressure, and separation of the placenta from the uterine wall, followed by hemorrhage, produce asphyxia.

To recognize the accident, one may sometimes diagnosticate the coiling of the cord by detecting a hissing sound slower than the fetal heart, and more rapid than the mother's arterial heartbeat over the fetal body near the head. In other cases, violent movements of the fetus, following a blow or fall in the mother, may lead the obstetrician to fear that traction is being made upon the cord.

In these cases delivery should be accomplished as rapidly as the safety of the mother will permit. The same is true concerning asphyxia from hemorrhage following placental separation. In placental prævia and accidental separation of the normally implanted placenta, the fetal mortality is high from asphyxia. The necessity for prompt delivery is as urgent in these cases as in cases where the cord is occluded.

The Treatment of Asphyxia.—All cases of labor should be so conducted that the obstetrician must prepare to treat asphyxia as soon as the child is born. Where this condition develops, the child should be firmly grasped by the legs and thighs and held head downward while the forehead is supported by one hand of the obstetrician. The nurse or helper should then wipe out the child's mouth gently but thoroughly, with sterile linen. The child should then be grasped by the thighs with one hand of the obstetrician while the other is placed across the back, the thumb and finger resting upon the anterior surface of the chest. The child's body should then be folded and unfolded gently but completely, the time occupied in counting six being sufficient for each motion. At intervals this motion should be stopped, the child's mouth again cleansed, and the folding and unfolding repeated. If there is any sign of respiration the child should be placed in a warm bath in which mustard has been stirred, and rubbed gently but quickly until the surface of the body is quite red. If a few drops of cold water be dashed upon the chest this will often excite respiration. If breathing does not follow, the child should be quickly dried and the folding and unfolding again repeated. So long as heart action can be detected the attempt to establish respiration should not be abandoned. A hypodermatic injection of strychnia, $\frac{1}{500}$ gr., digitalin $\frac{1}{300}$ gr., and atropin $\frac{1}{300}$ gr., may be given together.

At intervals the child should be laid upon a soft blanket or pillow, upon its right side with its head slightly lower than the feet, and opportunity be given for spontaneous breathing.

Cases of livid asphyxia usually clear up promptly with this treatment, and respiration becomes normal.

If the pulmotor be available this may be used, and is often successful when other methods fail. The swinging method of Schultze, and the treatment usually adopted for the drowned, are also available and are sometimes useful. By Schultze's method air will be forced into the lungs, but this will not necessarily cause the heart to beat nor establish normal breathing.

Pallid Asphyxia.—When the circulation of the newborn is reduced to so low a point that the child is pale, limp, and without apparent signs of life, the condition is known as

pallid asphyxia. In these cases the effort of the obstetrician should be directed toward rousing the circulation and then to establishing respiration.

To stimulate the action of the heart, $\frac{1}{300}$ grain of strychnia, $\frac{1}{300}$ grain of digitalin, and $\frac{1}{300}$ grain of atropin, may be given hypodermatically.

Artificial warmth should be applied, and the child's body gently rubbed from the limbs toward the heart. The interrupted Faradic current is of especial value. Two drachms of whiskey in one ounce of warm water may be injected into the rectum, or the lower bowel may be washed out by a copious irrigation of warm salt solution. The child should be kept with the head lower than the feet, and the pulmotor may be used to advantage to fill and empty the lungs. Counter-irritation over the heart by spirits of camphor, mustard and water, spirits of turpentine, or a flannel wrung out of hot water sprinkled with alcohol, may be used.

If the pulmotor is not available, the child may be wrapped in a hot towel, or a piece of hot flannel, held with the head downward, and folded and unfolded by the method described in the treatment of livid asphyxia. When the child's body is folded together, the abdominal contents are pushed upward against the diaphragm and the thoracic contents are pushed downward. The heart and its great vessels are thus compressed between the two, and the blood is forced out of the great veins. When the child's body is unfolded, the abdominal viscera descend, pressure is removed from the thorax, and the blood is given an opportunity to flow into the abdominal and thoracic viscera.

This simple method is thus of great advantage not only in establishing respiration, but in stimulating the action of the heart.

An indication of the success of treatment may be found in the presence of reflexes. If the child's pupils remain absolutely insensible to a small electric light, if the surface of the body remains persistently white and cold, if the child's muscles are completely limp, and if the finger dipped in salt water or in whiskey and passed down the throat rouses no reflex contraction of the muscles of the pharynx, the death of the child has occurred. If, however, there is the slightest

response to these tests, the effort to resuscitate must be continued. At the moment of death the sphincters often relax and meconium is frequently discharged from the bowel.

The Secondary Dangers of Asphyxia.—Although the newborn child may temporarily recover from asphyxia, it is more liable than others to inspiration pneumonia and to apoplexy of the lung, or injury to some of the thoracic or abdominal viscera. Violent efforts at resuscitation often injure the fetus fatally. In unskilful hands Schultze's method of swinging the child has produced serious injury.

Schultze's Method.—To perform this method of resuscitation, the operator stands grasping the naked body of the child, with the thumbs upon the anterior surface of the thorax and the fingers upon the posterior surface just below the scapulæ. The head is steadied between the upper portion of the hands and wrists of the operator. Bending forward, the operator then raises the body of the child over his head and shoulder with a long swinging motion. Reversing this motion, the body of the child is swung outward and downward until its feet are within a short distance of the floor. These motions are repeated with intervals of one or two minutes. When the child's body is swung backward over the shoulder of the operator the lower extremities are bent upward toward the abdomen, the abdominal contents are pressed against the diaphragm, the diaphragm is forced upward, and the lungs are compressed with the heart, forcing air out of the lungs. When the child is swung outward and downward toward the floor, the force of gravity carries the abdominal viscera downward, the diaphragm descends, and air rushes into the mouth and nose and into the trachea.

In most cases this method is successful in forcing air into the lungs. It does not, however, stimulate the heart, and if violently or unskilfully performed it has caused injury to the lungs and occasionally to the bones of the thoracic region.

Injuries to the Fetus during Labor.—In addition to the general results of birth pressure already described, the fetal bones may be fractured during labor, dislocation or sprain of the joints may occur, and various portions of the fetal body may be injured by direct violence.

Fractures of the Cranium.—When the pelvis is considerably contracted and the fetus is brought forcibly through the pelvis, fracture of the cranial bones is not uncommon. The region of the parietal bones is most often the site of fracture, as in difficult labor the head often turns transversely at the pelvic brim, and thus the parietal bone may be brought forcibly against the promontory of the sacrum. Such fractures may be accompanied by depression of the bone, or this complication may not be present. If the fracture is severe, the meningeal artery beneath the parietal bone may be wounded,

Fig. 158.—Cephalhematoma.

or the veins and sinuses of the brain may be injured. Intracranial hemorrhage will result, often with fatal issue. The cranial bones may also be fractured by the violence and unskilful use of forceps. When the head is transversely in the pelvic brim and the forceps is applied over the face and occiput, or when the head is oblique in the pelvic brim and the forceps is not applied to the sides of the head, severe pressure and forcible traction may often cause fracture. Such fractures are accompanied by the formation of a deep groove in the soft parts, extending often to the periosteum. Fractures

of the base of the fetal cranium are observed in cases of difficult labor where considerable force is used in applying forceps, or where the child's head is brought forcibly through a contracted pelvis in breech extraction.

In many cases complete fracture of the cranial bones cannot be demonstrated.

The bones of the face and the cartilage of the nose are occasionally injured where violent and unskilful attempts have been made to deliver by forceps.

The Signs and Symptoms of Cranial Fracture.—Severe and even fatal injury to the brain of the newborn infant may occur with but little visible indication of the severity of the fracture. The only evidence of serious complication in these cases may be a groove in the soft parts marking the pressure of the edge of the forceps blade.

In these cases the diagnosis of cerebral injury must be made by the symptoms. The child is fretful or stuporous and quiet, the pupils reacting but sluggishly to light. The child often has a peculiar and almost incessant cry or moan, the temperature is somewhat elevated, and the child's heart action feeble and irregular. By palpating the cranium, depression of the cranial bone can be made out.

Treatment.—The treatment of depression, or depression and fracture of the cranial bone in the newborn, consists in elevating the bone to its normal level. This may not require incision as in the adult, but a sharp hook may be introduced through the scalp, if it be not swollen, into the bone, and the bone gently raised by traction upon the hook. Other operators prefer to cut down upon the bone. Where the pressure has been sufficient to cause the child's symptoms, elevation of the bone will be followed by their disappearance and the gradual recovery of the child. In extreme cases, where the bone has been fractured, its fragments may have been driven into the cerebral substance, occasioning fatal injury.

Permanent injury to the nervous system may result from compression or fracture of the fetal cranium. Areas of softening and degeneration in the fetal brain may develop, and the child may show evidence of injury to the cerebral cortex or deeper tissues.

Fractures of the Fetal Clavicle.—Where the shoulders are excessively large and delivery is effected with considerable violence, one or both of the clavicles may be fractured. As this is rarely compound the accident is not often serious. To

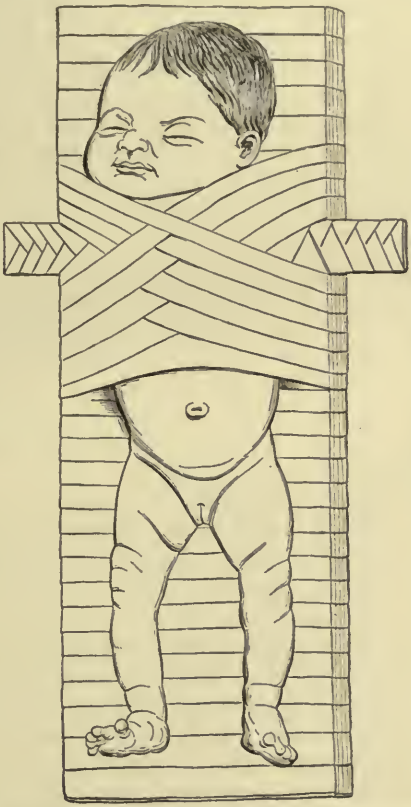

Fig. 159.—Fracture of both clavicles treated by bandaging the infant upon a thickly padded board.

secure good approximation is difficult, if the child be treated by the bandage and pad often used for adults. The most efficient treatment under these conditions is to bandage the child firmly upon its back upon a firm pillow or upon a

broad splint, so that the fragments are kept in good apposition. By using broad gauze bandages in the Figure-of-8, the child's body can be kept closely applied to the support, and thus union secured.

Fractures of the Humerus.—Where the arms become extended during breech labor, or where an anomalous transverse position is present, in which the arms must be dislodged, the humerus may be broken. The usual site of this fracture is at the junction of the upper third and the lower two-thirds. This fracture is usually caused by applying force to the shaft of the bone instead of passing the fingers down the arm to the elbow, to flex the entire upper extremity and to bring down the arm without fracture.

Fig. 160.—Greenstick fracture of humerus following difficult labor; breech extraction.

Such fracture is usually incomplete or green-stick in variety. There may not be typical crepitation, but the fragments can be felt to move, and there is more or less impaired motion.

Treatment.—In selecting splints for the use of the newborn, care must be taken that heavy material is not chosen, and that in applying the splint excessive pressure is not exerted. Pasteboard dipped in hot water can be readily moulded to fit the arm or shoulder of the newborn, and this with carded wool padding and a gauze bandage, makes a comfortable and safe application. The splint must be frequently removed and the bone examined by palpation to determine the progress of recovery.

It is difficult to confine the arm of the newborn unless it be

bandaged to the side and retained in position by broad bandages passing completely about the body. It is usually best to allow the child to move the hands and fingers freely.

Fractures of the Femur.—The femur is not often broken in children, and like the humerus its most usual site of fracture is in the upper portion of the shaft.

Fractures of other Bones.—In cases of extreme violence in delivery the child's ribs may be broken or other portion of the skeleton may be injured.

Dislocations.—Separation of the epiphyses of the long bones is more frequent in the newborn than the dislocations which occur in adults. These injuries often give but little evidence of their presence, except the dislike of motion on the part of the child, and sometimes lengthening in the shaft of the bone.

The treatment required is the same as that employed in fracture, and the necessity for caution and restraint are equally great.

The X-ray in Fractures and Injuries of Fetal Bones.—By this method we are able to diagnosticate injury to fetal bones when otherwise a complete diagnosis would be impossible. While the amount of calcareous material in fetal bone is much less than in adults, in the hands of experts satisfactory skiagraphs can be procured. In all cases of suspected injury the diagnosis should be made clear by this method.

Fig. 161.—Callus in fracture of the fetal humerus.

Dislocations.—Congenital dislocation of the head of the femur is the most important of fetal dislocations. This may be inferred when motion is impaired, with shortening on the affected side. The *x*-ray will confirm the diagnosis.

Dislocation does not often occur in other fetal joints, for fracture or separation of an epiphysis is more commonly observed.

Injuries to the Nervous System of the Newborn.—The brain of the child may be subjected to injurious pressure, producing laceration of the vessels with hemorrhage, softening of cerebral tissue, and permanent injury. This most often follows fracture or depression of the cranial bones, and may become apparent gradually during the first week or ten days of life.

The symptoms of the condition depend upon the part of the brain which is injured, or which is subjected to pressure through hemorrhage.

Injury to Nerve Trunks.—The brachial or axillary plexuses may be injured when the arms are thrown forcibly about the head in complicated labor. In severe cases the nerve trunks may be ruptured or so severely stretched that minute hemorrhage may occur in the nerve sheaths, thus injuring the neurilemma by pressure. In injuries to the brachial plexus, loss of motion, disturbances of nutrition in the muscles, atrophy, and sometimes spastic contraction of muscles, may result. These effects of injury do not at once become apparent, and if slight may escape observation.

Good results have been obtained by exposing the injured plexus, by incision, repairing torn nerve trunks with a very fine suture, resecting the injured portions, or performing anastomosis in such a manner as to utilize the sound portions of the plexus. In choosing the time for operation the surgeon must not delay until permanent injury has resulted.

Injuries to the Organs of Special Sense.—Where the forceps has been forcibly and unskilfully applied such injury may be inflicted upon the eye as to result in blindness.

In the experience of the writer a case was brought to hospital where repeated and unskilful attempts to deliver with forceps had been made. Abdominal section was performed and a large child delivered, which survived. The forehead and both eyes were much bruised, and for some time the extent of injury could not be accurately ascertained. Finally one eye was evidently not seriously damaged, while in the other the cornea had been wounded and the anterior chamber ruptured. The child was taken to ophthalmological clinics but it was found that the sight had been permanently lost.

The external ear may be wounded and lacerated by unskilful efforts to deliver, and the deeper portions of the ear are occasionally permanently damaged. In some instances deafness may become apparent as the child grows older, while it may be impossible to accurately locate the injury. In these cases, however, birth pressure through long delayed labor, or through the use of forceps, or rapid extraction, will be found to have been present.

Fig. 162.—Child's head bruised by attempts at forceps delivery. The mother delivered by section. The child survived, losing the sight of the injured eye.

Sudden Death in the Newborn.—During the first three or four days after birth the newborn child may be suddenly taken with failure of respiration, disturbed heart action, and great change in facial color. If stimulation be promptly administered, the child will often rally and may survive; but if delay is practised the result may be fatal.

It is difficult to accurately ascertain the cause of this alarming condition. It is sometimes associated with enlargement of the thymus gland, and is apparently caused by sudden turgescence of the gland and by pressure on the trachea and vessels and nerve trunks in the thorax. In some cases

mucus which the child has inspired during birth seems to temporarily plug the air passages.

When these symptoms develop, artificial respiration should be gently but thoroughly practised, and the child given strychnia, digitalin and atropin, by hypodermatic injection. Counter-irritation should be applied over the chest and external warmth. So soon as the child rallies, the intestines should be thoroughly irrigated with warm boiled water. In our experience, some of these cases have recovered under this treatment and the children have survived and subsequently developed normally.

CHAPTER XXIX

MIXED FEEDING

Where the mother's milk is insufficient for the child, it may be necessary to supplement it artificially. This is better than abandoning nursing, for nursing aids in the involution of the mother's generative tract and is of great value to the child should it become temporarily ill.

To supplement the mother's nursing successfully, the mother's milk must be imitated as closely as possible. For this purpose, a chemical examination of the breast milk should be made to determine its percentages of fat, sugar and protein. A microscopic examination should be made to show the relative size of the milk globules, and a bacteriological test should be added.

Cow's milk should be so modified as to imitate as closely as possible the percentages of the mother's milk. This is readily done by obtaining certified milk with cream of known fat percentage, and using a formula which is practically identical with that of the mother's milk. Remembering that cow's milk is less digestible to the human infant than the mother's, the percentage of fat and protein should be somewhat less than that of the mother's milk. If the cow's milk be pure, it should not be pasteurized nor sterilized.

If the child finds difficulty in digesting its artificial food, this may be partially predigested by the use of pancreatin and sodium bicarbonate.

In employing mixed feeding it is often convenient to preserve the mother's nursing for the latter part of the day and night, and to use artificial food during the early part of the day, when it can be more conveniently prepared. In many cases, if the mother is relieved from the burden of entirely feeding the child, the supply of milk may be increased and she will be able to do more than she otherwise would have

done. On the other hand, if the child becomes accustomed to the bottle and the mother is taken ill, or circumstances arise which makes it impossible for her to nurse, the child may readily be completely weaned.

In cases where the child seems unable to digest cow's milk and the mother cannot nurse it completely, the child may be successfully fed by obtaining the necessary chemical elements for its food, in condensed milk, whey and barley water. The fat necessary may be obtained by using an emulsion of olive oil, given separately several times daily. Some children who cannot digest cow's milk in any other form will do well by this method of feeding.

A considerable percentage of fat can be introduced into the child's body by inunctions of two parts of olive oil and one of alcohol, given night and morning. To secure the best results, the child should first be bathed quickly, but thoroughly, with warm water and with a mild and pure soap. Immediately after the bath the inunction is given with gentle but thorough massage. Several drachms of olive oil can thus be rubbed into the child at each massage, and the result is usually highly beneficial.

Wet Nursing.—Where the mother cannot nurse the child, the wet nurse was formerly the only reliable substitute. Unfortunately, the circumstances under which wet nurses are usually obtained are such as to render them unreliable and unsatisfactory. If the wet nurse is the mother of an illegitimate child, she may also be a person who has a specific disease, or who is of doubtful character. If her own child be living, she should nurse both her own and her foster-child, and few women can accomplish so much. If she puts away her own child, her mental disturbance may be such as to affect her milk.

The experiment has been recently tried of establishing a bureau for wet nurses, where responsible women are encouraged to signify their willingness to perform this function. It is understood that the wet nurse takes her own child with her, if it be living, and that she nurses both her own and her foster-child. This has worked fairly well in a limited number of cases.

The Examination of a Wet Nurse.—Before a wet nurse is allowed to assist a mother, the wet nurse must be thoroughly examined to determine her physical condition. The Wassermann reaction should be accurately made, and any other reliable tests to determine the presence or absence of syphilis and tuberculosis. The examination of the genital tract should also form part of the investigation to determine the presence or absence of gonorrhea, or some chronic septic condition.

In the management of wet nurses, it is often difficult to procure for them sufficient out-door exercise to maintain the general health. Their nutrition should be looked after, and the wet nurse should be under the supervision of a physician.

CHAPTER XXX

THE MEDICO-LEGAL ASPECT OF OBSTETRIC PRACTICE

Legal Requirements for Obstetric Practice.—To qualify legally for the practice of obstetrics different requirements in different states must be satisfied. All states recognize practitioners of medicine, including obstetrics, and some have provision by which midwives may practice. Large cities often have separate provisions for the regulation of the work of midwives.

The general standard of the profession in the United States calls for a definite number of hours spent in attendance upon lectures, demonstrations and quizzes on obstetrics in a medical curriculum. To this is added attendance upon obstetric cases. The State Board of Pennsylvania requires essentially a five years' medical course, the fifth year being spent as a resident in hospital. During the fourth collegiate year the student is to receive practical instruction from six obstetric cases, and during his hospital year as resident he is to study six cases in addition, making a minimum total of twelve.

In general, the courts recognize that anyone assuming the care of parturient women must show graduation from a reputable medical school, average knowledge, skill and experience, and faithful attention to the case in question. Undoubtedly the licensure from a State Board would be considered important.

It is also obligatory upon those attending confinement cases to report the birth of the child, to report cases of stillbirth, and to give death certificates for infants still-born, or dying soon after birth, and for mothers dying from pregnancy, labor, or the puerperal period. These returns cannot legally be made by an unqualified person.

Confidential Knowledge.—It is a matter generally accepted by courts that information gained by a physician in the discharge of professional duty is a privileged communication and that this need not be divulged. Obstetric cases are often of considerable local and social interest, and as pregnancy may be illegitimate, statements may be made reflecting upon the character of an individual. Should a physician called to a patient whom he found illegitimately pregnant betray this knowledge to the injury of the patient's reputation, he might be liable for damages. A noteworthy example of this occurred a few years ago in a foreign country, where one of the leading obstetricians of the world was called to attend a patient in miscarriage where there was doubt as to the legitimacy of the pregnancy. Without stating his reasons, he advised the members of his family not to meet socially the patient in question. This caused remark and led to a suit for libel against the physician, which at the first hearing was decided against him.

In cases of criminal abortion where a reputable physician is called to the patient after the abortionist has done his work, the physician should keep the patient's confidence. This, however, does not excuse him from coöperating with the authorities to discover the identity of the abortionist and to secure his apprehension.

As obstetric cases often excite considerable domestic and local interest and are invariably the subject of gossip, the obstetrician must be unusually discreet and reserved in what he says about them. It is better to err upon the side of caution than to be subjected to criticism, just or unjust, for betraying personal matters.

The Obstetrician's Legal Responsibilities for Asepsis and Antisepsis and for the Occurrence of Septic Infection.—The practitioner of obstetrics is supposed to exercise all reasonable precaution in the practice of asepsis and antisepsis in the conduct of labor. He is responsible for the condition of his hands, for the use, or lack of use, of gloves, for the condition of his instruments, appliances, dressings and materials; and if he recommends the nurse he is indirectly responsible for her observance of antiseptic precautions. Should septic infection occur in his practice, he would be

liable to censure and probably to action for damages, unless he could show that he had taken all reasonable and usual precautions, and that extraordinary circumstances had made the occurrence of infection possible.

The fact that the general practitioner of medicine who attends obstetric patients does not limit his practice to aseptic cases, but opens abscesses, attends diphtheria, scarlatina, and other infectious diseases, while maintaining his obstetric practice, makes him a more dangerous individual to his patient than the obstetric specialist, who maintains a constant effort to avoid infection. If, however, the patient employs the general practitioner, knowing him to be a general practitioner, and if under his care septic infection develops through diphtheria or scarlatina or some other case in his general practice, the patient is taking this risk in employing the general practitioner. If the general practitioner can show that he has used ordinary and accepted methods, and that he has made a conscientious effort to conduct his obstetric practice properly, he cannot be held liable for damage for infection arising, because of the nature of his practice. The patient took that risk in employing a general practitioner.

Cases in which suit for damage is threatened or sometimes brought for septic infection occurring in obstetric cases are those where the whole or part of a placenta has been left in the uterus, or where it has been notably observed that the physician was careless in sterilizing his hands, gloves, instruments, or appliances. The public are sufficiently familiar with modern medicine to recognize these conditions as unusual and resulting from negligence or ignorance.

The Responsibility for Injuries Occurring During Labor.—Where extensive laceration of the pelvic floor occurs during labor and the practitioner makes no effort to repair, he would be liable for damages. The fact that laceration has occurred does not necessarily reflect upon him, as the circumstances of birth may be such that laceration was inevitable; nor would failure of union in tissues, which he closed by suture necessarily convict him of negligence or of incompetence, for this accident may happen in competent hands. But his failure to attempt to repair lacerations at some suitable time, and by some recognized method, would be hard to excuse

or defend, and cases have occurred in which suits for damage were justly brought.

Permission for Operations.—It is commonly held that when a patient summons a physician this act constitutes a contract, should the physician render services, which obligates the patient for the physician's services, and places the physician under obligation to render faithful and competent service. Obstetric emergencies may arise so suddenly and be so grave in character that the performance of an obstetric operation may become necessary at any time during parturition or during the pregnant condition. It is customary to obtain the consent of patients for surgical procedures, and this consent is usually reinforced by that of the nearest relative or connection. It is held, however, by many that patients entering a hospital by this act confess their need for medical services, and that any reasonable operation is justifiable if properly performed by the staff of the hospital.

The advance of obstetric surgery has now made many operations elective—as elective section and the induction of labor. In these cases there is ample time to obtain the consent of the patient and her husband or nearest responsible relative or friend. In emergencies, the effort should certainly be made to obtain consent for operations, and in hospital practice the rules usually applying to hospital cases may serve. Where obstetricians are called to private houses in emergencies, it is sometimes difficult to obtain consent for major operations. In ruptured uterus, placenta prævia, placental separation, and eclampsia, no time can be lost, and the obstetrician should do his utmost to place the facts plainly before the relatives of the patient and to secure their consent to what is best. Women in labor are often so oppressed by suffering that they will gladly give consent to any procedure which will terminate their pain, hence the obstetrician must be careful to act from reason only and not to be swayed by his sympathy for a suffering patient. Some maternity hospitals have found it a good rule to have a patient and her nearest relative sign upon admission permission for any operation that is necessary by the staff, should necessity arise. This will give the staff power to treat obstetric emergencies as may be necessary without delay.

Should a patient be brought to a maternity hospital with ruptured uterus, without a friend or relative, and the patient be unable to comprehend what is meant by operation, the obstetrician would be justified in operating to save the patient's life, provided that his method was based upon sound surgical principles and was accepted by the majority of obstetric authorities. Should the patient die after such operation he could not justly be blamed, in view of the serious nature of the complication.

The Relative Importance of the Lives of Mother and Child.—Where the child is living and emergencies arise in obstetric practice, the obstetrician is usually asked to save the mother if necessary at the expense of the child. So common is this feeling that it has become an axiom of obstetric practice. Where, however, the obstetrician may offer to husband and wife a comparatively low rate of mortality for the mother, with an excellent chance of saving the life of the child, the husband and wife may assume the risk in the interests of the child.

Sterilization.—Unless it be necessary to sterilize a patient to save her life, this should not be done without the permission of husband and wife. In elective cases where children have already been born, and the physical and economic conditions of the family are such that further child-bearing will be an unsufferable burden, the obstetrician has the right, in delivering a patient by section, to render further impregnation impossible. Where conditions are doubtful and section is necessary, as where septic infection is present with other complications, the obstetrician should have permission to do whatever operation he thinks necessary. If upon opening the uterus septic conditions are unquestionably present and the mother's general condition is bad, hysterectomy with extraperitoneal treatment of the stump or extirpation of the uterus, will give the mother her best chance for recovery.

Therapeutic Abortion.—Where the mother's life is threatened by the continuation of pregnancy, therapeutic abortion or operation for the removal of the pregnant uterus, may be indicated. In deciding on therapeutic abortion, the obstetrician should have a consultation, unless he be a

specialist of recognized standing. While therapeutic abortion rarely comes under legal notice, a physician may be exposed to criticism in his community by those who wish to injure his reputation, and hence the necessity for the procedure should be generally accepted.

Criminal Abortion.—This, as the name indicates, is a crime. It consists in destroying by any means whatsoever, without just and sufficient cause, the life of an impregnated ovum at any stage of its development before viability is reached. After viability such a procedure would be infanticide.

The legal penalty for criminal abortion varies, but comprises imprisonment and fine in varying terms and amounts in all states. The aiders and abettors in criminal abortion are also liable to punishment.

Many makers and sellers of so-called abortifacient remedies are not only guilty of attempting to produce criminal abortion but are guilty of fraud upon their purchasers. Many of these preparations are inert and fail to produce the effect for which they are purchased.

A reputable physician cannot be an abortionist and retain his self-respect or the respect and confidence of the profession. No matter how skilfully or secretly done criminal abortion must always be a crime, and he who does it must be a criminal.

As the abortionist rarely sees his patient after committing the crime, they frequently come into the hands of reputable physicians. Such abortion is not complete, and many of these cases are infected by the abortionist. Reputable practitioners are called upon to treat incomplete abortion and septic infection. The practitioner must keep the confidence of his patient and do what he can to discover and apprehend the perpetrator of the crime.

It is well in these cases to avoid interference with the uterus until the practitioner has gained as much knowledge as possible concerning the case, and has had an opportunity to inform the authorities that he has a suspicious case in his care. He need not betray the name of his patient, but he can start inquiry which will find the criminal, and which places him upon record as being an honorable man. After he has

notified authorities, he may undertake whatever treatment will be necessary, including operation, realizing that should death follow, he cannot be accused of having by his operation been the original cause of the death. Should the patient be in a critical condition, or grow rapidly worse, he should notify the authorities at once to give them an opportunity to obtain from the patient an antemortem statement. Should death occur, he should decline to give a certificate until the coroner has had an opportunity to investigate. It is well to caution nurses who are in attendance upon cases that have had criminal abortion that they may be called upon to give testimony as to the patient's condition, and that they must not betray the patient's confidence while acting as a nurse, by talking about her to other persons.

The physician should exercise special caution in dealing with unknown women in all the aspects of medical and obstetric practice, and especially if he is called to a woman in the child-bearing age, finding her with evidences of pelvic septic infection and possible pregnancy or abortion, he should exercise great caution in his management of the case. Persons evilly disposed may sometimes accuse a physician unjustly, taking advantage of such a case to gradually injure his reputation.

Infanticide.—The fetus in the uterus is practically a part of the mother's body and has no independent existence. Once outside the mother's body it becomes a separate individual and if it makes one respiratory effort observed by credible witnesses, it has legally lived.

The destruction of the life of the fetus in the body of the mother is not infanticide, but would be criminal abortion, illegal operation, or misdemeanor. Infanticide is usually performed by the mother illegitimately pregnant, or by some friend who tries to hide her shame by destroying the child. Strangulation by pressure upon the neck, or suffocation by covering with a pillow or blanket, or over-laying, by which the pressure of the mother's body prevents the child from breathing, are the methods usually employed. It is often very difficult to find positive proof of infanticide. A woman illegitimately pregnant, delivered alone, may summon no assistance until the child has ceased to breathe. In the ab-

sence of pressure marks upon the throat, or signs of direct interference, infanticide is difficult to prove.

It was formerly thought that postmortem examination should demonstrate that air had entered the infant's lungs, or that it never had breathed. This is not an invariable test, for the child's lungs are not expanded fully for several days after birth, and methods of artificial respiration may force air into the lungs of the child which never breathed spontaneously. If, however, it could be shown that the mother had no medical attention at birth, that she was found with the child dead, and autopsy showed air to any appreciable extent in the child's lungs, the inference would be a fair one that the child had inspired; but if medical attendance had been at hand, and the physician had made efforts at artificial respiration, air might still be in the lungs, and the child never have spontaneously breathed.

Infanticide may be perpetrated or attempted by throwing newborn infants into cesspools, or out of railway trains, or into deserted places behind fences, so that death may be spontaneous. The viability of the newborn infant, under these circumstances, is sometimes surprising. In the observation of the writer, a newborn infant was thrown into a cesspool on an exceedingly cold winter's night. The contents of the pool were so frozen that the child did not sink, and its cry was heard by a passing policeman, who rescued it alive.

While it might not be proved from marks of physical injury that a child found in a deserted place had been strangled, if the child could be traced to the mother or her attendant, the act of desertion and the abandoning of the child without care, would constitute infanticide.

Over-laying.—Where the mother is exhausted and lies in a heavy sleep with her infant in the bed with her, or where she is drunk, she may turn upon the child and suffocate it by her weight. This is called over-laying and is not uncommon among the exhausted and vicious poor of large cities.

Sudden Death in Infants.—An infant under good care is sometimes found dead, or dies suddenly without known cause. In these cases some trivial circumstance may be

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alleged as the cause of death—as the placing of the child upon a pillow. Unjust blame and suspicion may be aroused.

These cases should invariably come to autopsy, for it must be remembered that there are several conditions in the newborn infant which make sudden death possible without interference. One is the sudden enlargement of the thymus gland, causing pressure on the thoracic viscera. Another is the failure of the Eustachian valve in the heart to close; and still another is the occurrence of pulmonary apoplexy or cerebral apoplexy in children that have been born in long and difficult labor.

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